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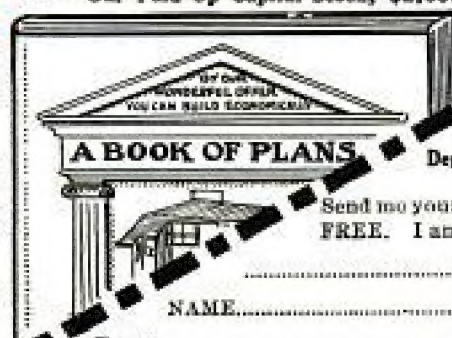
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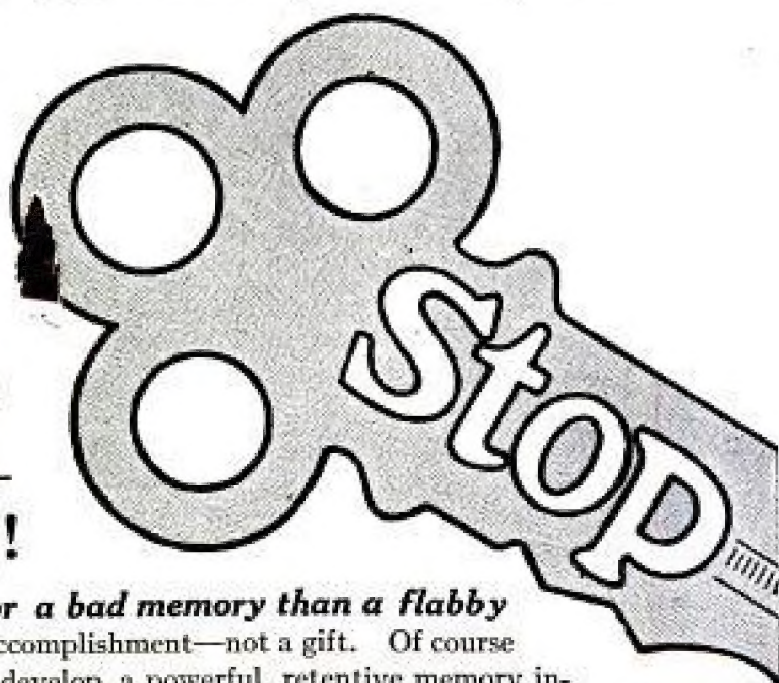


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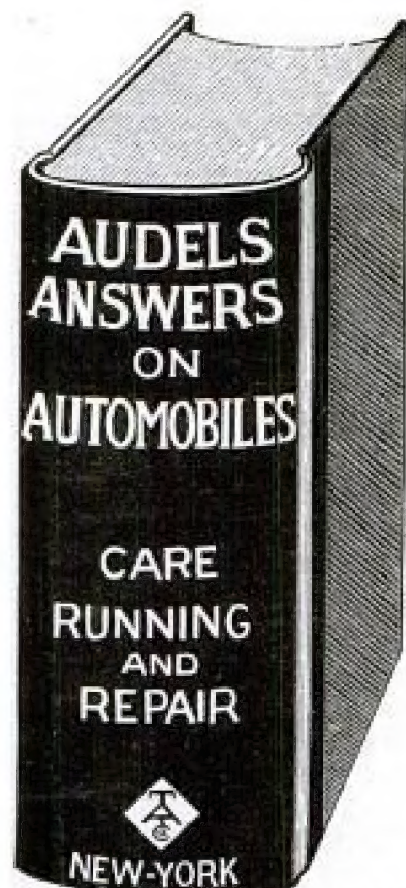
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WE Help House Capital at once to start you in retail—manufacturing—patent—real estate—mail order or any legitimate business by means of "Our Practical Method." Particulars free. The Business Aid Co., K224, Detroit, Mich.

41 A WEEK will start you in a big money-making mail order business—with the best line—in spare time. Particulars free. Nudico Company, 1684 Belmont Ave., Chicago.

5 DOLLAR 5 Getting 5 Secret 5. Send stamp at once for six valuable Trade Bulletins; start a profitable business of your own and make more money. G. Edward Harrison, Baltimore, Md.

A Bit 84c on Saturday? I pick up \$1,500 yearly additional from newspaper correspondence. My book tells what's new, how to get it, where to sell. Newspaper directory included. No correspondence school expense; only 50 cents. Morris White, Station 50, Detroit, Mich.

INDIFFERENT your business under Arizona laws. Cost small. No franchise fee. Stockholders exempt from corporate debts. No business anywhere. Laws and forms free. Southwestern Securities & Investment Company, Box 1488, Phoenix, Arizona.

AN intelligent person may earn \$100 monthly corresponding for newspapers, no commission. Send for particulars. Press Syndicate, 509 Lockport, N. Y.

RAISE Glowing, \$1 per ft. of ground, 1/2 A. \$25,000. Write, Glowing Gardens, Sheboygan, Wis.

I MADE \$50,000 in five years with a small mail order business; begin with \$5. Send for free booklet. Tell how. Booklet, 5074 Lockport, N. Y.

MAKE yourself independent for life raising Glowing. Requires little capital and spare time only. Worth \$1 a lb. Yields 5,000 lbs. to the acre. I'll teach you free and buy all you raise. Write T. H. Sutton, 1080 Sherwood Ave., Louisville, Ky.

HAVE you a mechanical device, toy, novelty, household or mail order article? If so, patent it through me and start in business with it. I show you how; Booklet free. Send it. 53 Cully Bldg., Chicago.

INDEPENDENCE and fortune quickly obtained in the Manufacturing Mail Order business. I furnish Formulas, Manufacturing Processes and Trade Secrets in all lines. Sold under positive guarantee 18 years' practical experience. Rejection and improvement of Formulas and Processes—reduction of manufacturing cost—utilization of waste materials, etc., a specialty. Booklet, Formula List, and Valuable Information Free. W. L. Cummings, Ch. 12, 127 Standard St., Asencuse, N. Y.

STOP! Here! Let me start you in a home business that will bring you money every day. Experience unnecessary. Spare time. No canvassing. I furnish everything and guarantee success. Send for proofs. Voodhies, Desk C. B., Omaha, Neb.

FURN a corporation—Congress Law for D. C. and all States; cheap. Raise money easily. U. S. Legal Corporation, Washington, D. C. Representing \$1,223,000,000.

COLLECT money by a sure, simple, system. Income \$1,000 to \$5,000 a year. Quick results. No capital required. Instructive book, "Simplified Collecting," free. National Collectors Ass'n, Long Street, Newark, Ohio.

I WILL start you earning \$1 daily at home in spare time, clearing errors; no capital; send for free instructive booklet, giving plans of operation. U. P. Redmond, Dept. 206, Boston, Mass.

HAVE you anything to advertise? Our Rate Book tells you all about advertising mediums, rates, circulation, closing dates, etc. Sent for 10c. Worth dollars. Folder free. Correspondence invited. Dearborn Advertising Agency, 455 Franklin Bldg., Chicago.

PATENTS secured—U. L. Parker, 914 G St., Washington, D. C.

PATENTABLE Ideas Wanted—Send for 2 free books. Richard H. Owen, 30 Owen Bldg., Washington, D. C.

AGENTS WANTED

FREE, swell suits to wear—plenty of money to spend as our special manager in your town. Make \$10 a week easy. Suits sell like hot cakes. Your own free suit will get words of orders from your friends. Only part of your time. No money no experience necessary. All orders we take in your section turned over to you. This is a most stupendous opportunity for one man in early town. Get in quick! We pay express on everything. Send a post card with your name and address for beautiful samples and full particulars, all free. Entirely new plan. Chance of a lifetime. Don't miss it. No obligations. Hurry! Write today. American Woollen Mills Co., Dept. 1197, Chicago, Ill.

WE pay you \$2 a day and extra liberal commissions to take orders for toilet preparations, finger saws, fountain pens, razors, and fully guaranteed jewelry. You make sales at sight, giving your customers choice of many valuable premiums. We give you extra cash, allow credit and share with you the profits on each of your orders. We offer agents the biggest money-making proposition in America. Now is also the best season to sell our big, new line of fully guaranteed holiday goods, beautifully illustrated in expensive, large catalog free to agents. Write today. Best Mfg. Co., 52 Ontario St., Philadelphia, Pa.

AGENTS—Great news—here is a snappy brand new money maker. No one else has it. Listen—give a \$2 booklet set free with each pair of our wonderful new self-sharpening patented shears and still make 100 per cent profit on every sale. Agents getting rich. Gaslight sold 33 first 15 hours—profit \$120. Heavy took 163 orders first week—profit \$120. Heavy sold 600 out of first 119 he visited. Knowled best order for \$300 worth. Sworn proof and convincing particulars. Free samples to workers. This is a real fortune builder. Write quick. Peoples Supply Co., R-43, Kansas City, Mo.

AGENTS making \$10 daily. Do you blame them for clicking to show Cards? Of course you don't. But 318 varieties sell across all in caps. Josh Billings said "I don't care what a man's profession in life is, if he is too much for the Komishun he is a hero." Why not sell Show Cards and be a hero and listen to the silver jingling in your pocket? Our changeable signs and price tickets. Our Show Cards are great, you'll say so. Don't hesitate; write today for two color catalogs. Popular Show Card Co., Desk Q 11, 1235 Michigan Ave., Chicago, Ill.

ANYONE can make big money easy selling the Aladdin Kerosene Mantle Lamp. No experience necessary. A demonstration sells a lamp in nine out of ten homes. One agent sold over 1,000 in money-back guarantee, and one returned. Another made over \$300 in 15 days. Hundreds doing as well. Evenings may be made profitable. Special introductory offer to the first man in each neighborhood who writes for agency proposition. Mantle Lamp Co., 251 Aladdin Bldg., Chicago, Ill.

SPECIAL Sales Manager wanted in your town right away. Plenty of money for you to spend. Highest tailoring offer ever made. Orders turned over to you. Make \$50 a week at the start. Only part of your time. Your noble free suit will attract so much attention that orders will simply roll in. Every order means dollars to you. Other good features. Paragon suits sell like wildfire. We prepay all express charges, too. Now is the time to get in. Be the first in your town to get this great offer. An opportunity to make the highest success ever. Send post card with your name and address for our book of beautiful samples and full particulars. All free, no write at cost. Paragon Tailoring Co., Dept. 117, Chicago, Ill.

SELL silk and hosiery, straight from manufacturers, every agent makes at least \$3 per day, many \$5 to \$15. Our best prices, our prices astonish, everybody buys. Agents turn free—see how easily you can make money. Sample sale 10c, hose and outfit 25c. Service Hosiery Mills, Tullahoma, Pa.

AGENTS—Be quick—don't wait—get the answer, a stream of profits, agents greatly excited sending orders thick and fast—order such a seller, per sub-agent—make \$150 a week. Model Vacuum Cleaner, carpet sweeper type, wonderful suction. Sells for \$4.50, your profit over 100 percent—no competition—patented, we start you, the Cleaner sells itself, everyone delighted. Send no money, just a postal asking for terms, territory and free sample to workers. Model Vacuum Co., 100, Cincinnati, Ohio.

AGENTS on salary or commission. The greatest agent's seller ever produced; every use of pen and ink buys it on credit; 200 to 500 per cent profit; one agent's sales amounted to \$450 in six days; another \$35 in two hours. Monroe Mfg. Co., A., 9, La Crosse, Wis.

\$10 IN profits made by twelve agents selling the Home Vacuum Cleaner. Highest and best Agents seller on the market. Demonstrated in an instant and sells on sight. California Representative sells 129 a month a week. State and Territory Agents wanted. Must be responsible business men with little capital. Home Vacuum Cleaner Co., 1926 Mahan Ave., Chicago.

MAKE More Money! Start in the Mail Business—operate "Sales Salesman" system—can be done in spare time and the possibilities are unlimited. Do not invest any money in the Mail Business until you read "Booster" for The Booster Magazine starts you in business for yourself—gives you next to the best money making proposition on earth—now that really get you the money! Get away from wage slavery! Send 10c for two months trial subscription. Booster Magazine, 240 Northwestern Building, Chicago.

WANTED—Agents to sell our hardy trees and plants throughout the whole west and New England; now is the time to start; experience not necessary; ability and persistence is what counts. Write today for prospectus and free outfit. Blue Brothers Co., Geneva, N. Y., Dept. 31.

A **LARGE** well known company about to spend \$150,000 on a tremendous advertising campaign requires the services of a talent man or woman in each town and city. The work is easy, pleasant and highly respectable and no previous experience is necessary. We will pay a good salary and offer an unusual opportunity for advancement, to the person who can furnish good references. In addition to this salary, we offer a Maxwell Automobile, a Ford Automobile and over \$5,000 in prizes to the representatives doing the best work up to December 31. In your letter give age and references. Address: Ira H. Hamilton, Advertising Manager, 253 Bedford St., Boston, Mass.

AMAZING invention. Easily used kind lamp burner, generates gas, makes extremely large powerful white light. Smokeless, odorless. Sells everywhere. Nothing like it. Exclusive territory contracts granted. Desirable not sold in stores. Agents making big money. Experience unnecessary. Sample outfit 25c postpaid. Particulars free. Hamilton Co., 1301 Sydney Bldg., Toledo, O.

AGENTS—General Agents. Handle new invention—Home Beauty and Massage Machine. Made of genuine aluminum and red rubber. Easy to use. Great article—splendid profits. McGrath, N. Y., averages \$31 weekly. Read Idaho, made \$75 one week. Lett, W. Va., made \$3 first hour. Write today for special proposition. Queen Mfg. Co., 1138 Nash Bldg., Toledo, Ohio.

EARN \$15 to \$25 a week or more on our Mail Order Dealer Right from your own home. Hold your position until entire time is required. We are manufacturers and owners of patented just-in-season specialties. If you are just starting a Mail Order Business or if already established, you can't afford not to handle our Patented Money-Making Geyers. We sell exclusively to our Mail Order Dealers. We protect them. We carry stock and furnish everything. No canvassing. Small capital. Experience unnecessary. Write today for Latest Patented Leader and Manufacturer's Easy Selling Mail Order (copyrighted) plan backed up by "Whole Truth," Positive Proof and Grand Statement. J. M. Pease Mfg. Co., 339 Pease Bldg., Main St., Buffalo, N. Y.

AGENTS—Here's a proposition which sells itself; the agent don't hold the bag; we guarantee the sale; wonderful new invention; sells like fury at 75 cents; on market few weeks; swamped with orders; everybody wants territory; past salesmen making \$10 daily, good ones coming money; write quick. Leon Sales Co., Dept. 103, Waukegan, Illinois.

AGENTS Headquarters: Big Profits! Quick Sales!!! Get next to the following live ones. Ideal Knife Sharpeners, New Combination Lighters, Patent Clothes Sprinklers, 20th Century Gas Spark Lighters, Magic 1000 Books, Feather Ventilators, Wonder Needle Threader, New Family Records, White Cross Tea and Coffee Percolators, Aluminum Table Sets, etc. Circulars and Agents Free! Write to: Victor H. Co., Chicago, Ill. E. S. A.

WANTED one good man in each town to take orders for men's tailoring; beautiful styles; very low prices; orders come easy; high class; permanent business; five profits, \$10 a day and up; no money or experience needed. We ship on approval express prepaid, and guarantee perfect fit. Write for free sample outfit and inside price on suit for yourself. Monner Tailoring Co., Dept. 707, Chicago.

AGENTS—Men and women make big money selling "The Hygienic Comb Cleaner." Delay make sales fast. Order today. Sample with terms, postpaid, 25c. Charles A. Thompson, 21 Morton St., Brooklyn, N. Y.

AGENTS—A sure big money maker. \$5 to \$10 per day easily made selling Hix's Best Silver Cleaner for cleaning all metals without rubbing; also cleans glassware and woodwork. This is no make believe but the real thing. No previous experience required. Write at once for a sample package and prospectus. E. G. McCrackin, 134 Lakeland St., New Bern, N. C.

NEW fast selling patented device. The "Bill Grip." A metal clip for carrying and protecting money in the pocket. Takes the place of pocket book. Only thing of kind on the market, and sells on sight. Selling price, 50c; \$10 a day easy. Send for descriptive circular or 25c for sample. H. K. Hannah, 277 Broadway, New York City.

MAKE \$21 Next Saturday. Sell the Marvel Vaporizer for Coal Oil Lamps. This new lamp—makes brilliant white light—no smoke or smell. Selling like wildfire. Agents excited. Glenscock, Ark., made \$204 in five days. Kretzer, Mo., made \$21 yesterday. Write quick for proposition. Fairchild & Co., 474 Nash Bldg., Toledo, Ohio.

MEN agents wanted everywhere to sell the "Masked Lamp," the best light-giving, fire-burning and most practical lamp made; show them at night and make big money; I will instruct you how. E. R. Gaskell, 28 School St., Boston.

AGENTS, sell to saloons—machine sold like wildfire, 100% profit; free sample and course in salesmanship. Only two sales a day means \$15 a day for you. It's easy. Write. Shopper Mfg. Co., Dept. C, Kansas, Ill.

AGENTS \$15 outfit free to workers; big profits; easy sales, exclusive territory. Selling Transparent Handle Knives and Razors. Write today. "No money wanted." The United Cutlery Co., E. Fourth, Canton, O.

AGENTS—250% profit. Wonderful Ut-1a article. Sells like wildfire. Can be carried in pocket. Write at once for free sample. H. Matthews, 1042 Third St., Dayton, Ohio.

AGENTS just coin money selling New Improved hosiery direct from mill with our 30c advertising offer; you can make \$25 daily; everybody buys; credit samples in leatherette case, free. New Improved Knitting Mills, Dept. 34, Chicago.

AGENTS—New "Calendar" 10 piece Aluminum Set. An unparalleled opportunity. The aluminum trust prices smashed. A fortune for you in next six months with this special. Householders will order it; don't delay a minute. Dundee Mfg. Co., 402 Channing St., Boston, Mass.

AGENTS—\$4.50 to \$12 a day during the summer season. Investigate. Repeat order orders. Samples and catalog free. George Kramer, Staatsburg, N.C.

MANAGER wanted every city and county, handle best selling business known, legitimate, new, exclusive control, no insurance or book carrying. Address: Chas. J. Hinkley, 43 West 11th St., New York.

AGENTS—Something New—something fresh—something new. Something that's a seller, and bringing our boys \$35 a week and up. National Manufacturing Co., Lombard, Ill.

WANTED—One man or woman in every locality to start a Condy Kitchen. Best paying small business on earth! Few dollars starts you. Get away from wage slavery. Write for our literature; it's free. W. H. Hartner, West Mohawk, Oswego, N. Y.

SINKING of the Titanic. World's Greatest Sea Disaster. Full account of the destruction of that floating palace during those historic night hours. Explored for \$1. Agents wanted, terms and instructions, 20c. Get the official edition only from our Wayne Binding Company, Waukegan, Indiana.

RELIABLE salesmen dealing with department stores, jobbers, hardware and curioery trade, etc.; also agents, general agents and lining canvassers can make \$5 to \$10 daily. Berlin, 626 East 101st St., New York.

AGENTS—Handkerchiefs, dress goods. Colleton made \$8 one afternoon; Mrs. Bonworth, \$25 in two days. Free samples. Credit. Stamp brings particulars. Freeport Mfg. Company, 50 Main St., Brooklyn, N. Y.

FOR the Tailoring Agent. We have the smoothest proposition of them all. When you get our line you will drop all others like a hot rock. Send postal for free outfit and find out why. Famous Tailors. Dept. 104, St. Louis.

RENT agent evaporator pencil. Will remove rust and ink marks instantly from the most delicate cloth without injury. Everybody buys them after one demonstration. Agents wanted for unoccupied territory. Sample 25 cents. Talent Chemical Co., 615 Thelen Bldg., San Francisco, Cal.

AGENTS—If you don't make \$4 profit the first day selling Hux's Dust Absorbing Dust Cloth, etc., return samples. Many Agents make \$25. Write quick for particulars. Dept. B-4, Consumer's Direct Supply Co., Boston, Mass.

AGENTS—Get particulars of one of the best paying propositions ever put on the market. Something no one else sells. I can make \$4,000 yearly. E. M. Feldman, Sales Manager, 6124 Syracuse St., Cincinnati, O.

AGENTS make 500% profit selling our gold window lenses, novelty signs and changeable signs. 300 varieties in enormous demand. Catalogue free. Sullivan Co., 128 Van Buren St., Chicago, Ill.

AGENTS—Men and women; sell Guaranteed Heaters. Credits plan helps you. The line that repeats. Exclusive Agency to Hustlers. Address: D. J. Scher Mfg. Co., Denver, Colo.

RED profits for you! Manufacture Huxley Crisp, New confection. California, incandescent. Be package costs you 1c. Machine instructions complete, \$7.50 prepaid. Samples 10c. Shaffer Co., 1915 Howard St., San Francisco.

AGENTS—Guaranteed Shoes, must wear one year or new pair free. All styles. 98c guaranteed. 98c profit on every sale. Quick seller. Write today for complete outfit. Guaranteed Shoe Co., 2262 Third St., Dayton, O.

AGENTS make \$20 weekly, permanent, easy work, experience unnecessary, particulars free. Pels Manufacturing Company, 425 East 14th Street, N. Y. City.

AGENTS for Red Seal Foot Comfort, acts like magic on tired aching feet. Small also 18 cents, sample free. Francis Company, 257 1/2 York St., Jersey City, N. J.

AGENTS make enormous profit handling our quick-selling Oriental novelties. Post-they sell! Orders. Exclusive territory. Shaw Kaminski, Box 329, Portland, Oregon.

GET an Elegant Suit and make \$10 a day, selling as our representative in your town. Wear the swiftest suit your town ever saw—made to your exact measure, from your choice of cloth and styles. It need not cost you a dollar. Make \$10 a day showing your suit—taking orders for elegant Made-to-Measure Suits, delivered express paid for \$7.50 and up. We are spending a big sum to acquire and assist a representative in every town. We make prices so low—your profits so big—confidential terms so liberal—that we can explain these only in a letter. No money or experience required. We want your spare time—not your money. We bank you with our capital—teach you everything—give you the big trade price. Do you want the Exclusive Agency in your town? Then write quick and get the whole proposition, costs and everything—absolutely free. Chicago Woollen Mills Co., 334 Jackson St., Chicago.

AGENTS—\$40 a week. Sell our specialties. Big winners. Salesmanship course and samples free. Write now. Simplex Mfg. Co., Dept. 35, Kewanee, Ill.

BE the first in your locality to sell the new Tuff-Bowen-Wilson pencils. Quick seller. Immense profits. Samples and terms, 10c. Elfrer, Burton J., Oshkosh, Oshkosh, New York.

AGENTS wanted, send 25 cts. for 35 Post Cards and one of each of our Catalogues with Agents Terms, A. S. Mankin & Co., Alexandria, Va.

AGENTS—Portraits. Mr. Fraynes, 15c. Short Portraits in Stereotypes 25c. Views 1c. 30 days' credit. Samples and catalog free. Consolidated Portrait Co., Dept. 7196, 1027 W. Adams St., Chicago.

AGENTS—One cent invested in a Postal Card will bring you a \$25 to \$50 a week proposition. American Aluminum Co., Division 7, Summit, Ill.

MAKE money selling the Matchless Pocket Lighter. Handless thing imaginable. Every smoker buys. Sample 50c. Agents and dealers wanted. Texas Novelty Co., Houston, Texas.

AGENTS wanted to sell Air Brush Design Show Cards, Price Tickets, and other specialties for merchants. Big profits. Catalog free. Merchants Specialty House, 929 Franklin Bldg., Chicago.

AGENTS—Big profits selling best toilet and medical preparations as side line or exclusively. Write. N-Ray, Salina, Kansas.

AGENTS—\$1 daily. "New Novelty" everyone treating shoes buys; 25 cts. toilet sample; lightning seller, steady income, set instantly. Montgomery Supply, St. Clair, Pa.

\$100 MONTHLY and expenses to travel—worthwhile men and women to travel and distribute samples; big manufacturer. Steady work. S. Schaffer, Treas., C. W., Chicago.

KE-99 is the best bug killer on earth. Sells on its merits. Easy, quick, repeat seller. Profits 200%. If you make it yourself. Price, agent salesman and particulars free. A. Hader, Box 273, Chelsea, Mass.

AGENTS—Don't you know a fine line of household articles for best, and sell easiest. Samples free and catalogue. Chatot Mfg. Co., Providence, R. I.

SAY, Mr.—Look at this winner. I offer it to you. Take hold now; profits big; easy work. Free particulars. David Supply Co., Box 199, Chicago, Wyo.

AGENTS—Variety specialties. Hosiery, Perfumery, Toilet soaps, Jewelry, Aprons. Big profits. Wholesale prices. Terms free. Black Bros., 471 Ninth Avenue, New York.

LEARN the truth about Mail Order Business before buying outfit. Valuable information and particulars free. Mail Order Library, P. Tompkinsville, New York.

SIGN Agents—Painters. Something new and better. Attractive ready-made gold and silver letters, 21 kinds, easily applied. Make big money lettering signs, windows and selling sparkling chipped glass nameplates. Catalogue and sample letter free. Artcraft Sign Co., 2453 N. Clark St., Chicago.

ONE agent in a town can make \$10 daily selling "Nidia" Embroidery Applique. No needles. Easy to sell. Big profits. Sample materials and illus. Catal. free. Madison Embroidery Co., Desk 3111, Chicago, Ill.

AGENTS that appreciate an article that doubles their money. Try Ditzgen's Floor Protectors. Send 2c sample and terms. Imperial Rubber, 4109 Lake Shore Blvd., Cleveland, Ohio.

AGENTS—How many houses can you make each day? 25 cents clear profit each house. Write: Reed Co., 43 South Tremont Ave., Indianapolis, Indiana.

I WILL put you in a position to make good money at home; no capital; send for free instruction letter giving plans. Box C R, Pittsburg, Kans.

AGENTS own your own business; no capital needed; steady income selling our new champagne signs, gold and silver letters; in demand everywhere. Write for catalogue. Climax Novelty Co., 593 Gay Bldg., St. Louis.

GENERAL and local agents wanted to sell direct to owners our patented, highly endorsed, quick selling automobile, motor boat, and motorcycle accessory. Exclusive territory assigned. National Sales Company, Boston, Mass.

AGENTS or part time workers: Big, generous, cash commissions as high as 20%—splendid variety, attractive offers. Write for proposition. No obligation. Technical World Magazine, 5775 Durand Avenue, Chicago, Ill.

EARN \$25 to \$50 a week selling Serrette, the new table servant. Write for our interesting proposition. Serrette Mfg. Co., McGraw, N. Y.

AGENTS wanted to sell our fast selling specialty in gate liner, \$1 a day easily earned. Particulars free. Warren Novelty Co., 5615 Chester Ave., Phila., Pa.

BIG Proposition to Agents Something new, Hellog Parker Pen with compressed ink. Write with water. Sample 25c postpaid. Everybody wants one. An immense Christmas seller. Wm. Muller, Security Bldg., San Francisco.

AGENTS—New, easy sales, enormous profits; most unique offer, samples, 50c postpaid; particulars free. Send today. Williams Specialty Co., Buffalo, N. Y.

RELIABLE men—women sell Florida by leasing with each family on trial; every trial means sale. Profit \$2 to \$1 daily; results given. The Bacon Co., Elmhurst, N. Y.

BOYS, girls and grownups investigate this! New household specialty; very excellent. Unique selling plan gets every household. Particulars free. Winnie Co., Northampton, Mass.

AGENTS—Get rich, sell every auto owner. Permanent orders to customers. We show you how. Arnold Supply Co., 1140 Morton St., Germantown, Phila., Pa.

AGENTS are making \$10 a day working for us. You can do the same. Get busy now. Complete sample outfit, 50c. Particulars free. Lenzel & Sons, Miami, N. Y.

AGENTS—First in your territory will make not less than \$100 monthly profits. Hurry. Agents' Supply Company, Desk M, Topeka, Kansas.

ARE you content with mere house-to-house canvassing? I have something better. Particulars free. W. F. Jandson, Lyons, Colo.

AGENTS—Only six new winners are big money-makers for you. Let us prove it. Graham Sales Co., Birmingham, Ill.

WATER strainer, costing 2c, sells 15c. Detroit Filter Co., Detroit, Mich.

REMNANT Store, Dept. 10, Cincinnati. Greatest dry goods bargains on earth. Proposition to agents and stockholders.

READ the Agents Magazine, 2 months 10c. Yearly 50c. Agents Magazine, Chicago.

PROFITABLE Home Business. New, easy. Knell, Box 2221-Y, Boston, Mass.

AGENTS—Most order items. Your 25 word ad in 100 Magazines, \$1. Box 72, Station B, Worcester, Mass. The Williams Specialty Co.

AGENTS—We want you. Write Postless Co., West Hartford, Conn.

AGENTS—It costs me \$2 to ship sample machine, but proves I've lost household invention on earth. Stevens (Inc.), 1189 River St., Aurora, Illinois.

PATENTS Bring Wealth. Proof—Advice free. A. Wedderburn, Patent Attorney, Washington, D. C.

PORTRAIT Agents for good work, write to W. J. Benadict, Chicago, Ill.

HIGH School Managers. Full story; sample and terms, 15c. Roxbury Card Co., Roxbury, Mass.

AGENTS—Men, women. High-grade household specialties. Quick sales. Big profits. Free samples and catalogue. Send premium offer free. Beaumont Supply Co., Pasadena, Cal.

GENERAL Agents, agents and canvassers. 100% to 200% profit. Shurkey, \$15 first day; Mares, \$13 every day; Mackey's made since Dec. 5th, \$1.25 per day. Wilson, Johnson, \$9 per day; Hubbard and others do not average less than \$5 day. Write for free sample and particulars. Foreign representatives wanted. Lester Mfg. & Sales Co., Cleveland, Ohio.

PORTRAIT Agents, 16x20 crayon, sepia, pastelling, bromide, 10 cents; big money in our convex portraits; delivery guaranteed or money back; portrait and frame catalog and samples free. Skelgrip Portrait Co., Dept. P.M.3, 3210 Ellis Ave., Chicago.

\$2 AN hour canvassing household articles. Sells at sight. Sample free. Household Mfg. Co., 30 Gay Street, Hartford, Pa.

AGENTS—Highest grade propositions only. Exclusive territory. Men or women. Quarante Products Co., 712 Monmouth Block, Chicago.

AGENTS Wanted—Sell High Looking. Imported 36x48 rugs, \$1 each. R. H. Carter, Milan, Tenn., sold 115 in four days; his profits, \$77. You can do as well. Write for sample offer and unique selling plan; exclusive territory. A. Condon, Big Impeller, Stoughton, Maine.

WE furnish you capital to run a profitable business of your own. Become our local representative and sell guaranteed Strangers, Shirts, Socks, underwear and laundry direct from our factories to the homes. Write, Seaboard Mills, Dept. 12, Cohoes, New York.

PORTRAIT agents find our plan beats all others. Prompt shipments—refunds credited. 30 days' Credit. Catalogue of Portraits, Frames, Photo Tons, Sheet Makers and samples free. James C. Bailey & Co., Desk M, Chicago.

\$2.50 PER day. Paid one man or woman, in each town, to distribute free circulars and take orders for concentrated floorings in tubes. Permanent position. J. S. Ziegler Co., 443-D Dearborn St., Chicago, Illinois.

AGENTS—Live hustling men to canvass the houses and offices, selling our new electric device. Cuts electric bills in half. A demonstration sells it. Repeat order gets. You can make big money without previous experience. Complete outfit and selling instructions \$3.45 and I guarantee money back if not satisfactory. Exclusive territory is going fast. Write me to-day for my proposition. Stanley R. Froberg, 111 Station F, Cincinnati, Ohio.

AGENTS—To sell the newest electric appliances on the market; sold everywhere there is electricity. In the home and office, liberal profits; sales-driving sample, weighs a pound, no experience or knowledge of electricity required; it shows how to use one light instead of two and get the same results; sells for \$3.50 and saves the purchaser an investment of \$25; write for particulars. The Handy Light Co., 111 Handy Light Bldg., Cincinnati, Ohio.

AGENTS—Salesmen—Seasonable seller, best \$2.50 electric invention this demand never before supplied; home, office, store, everywhere eagerly sought, repeat orders outnumber first sales, no control territory, no competition, unlimited possibilities. Write Frank W. Alden, Agency Manager, 123 Station F, Cincinnati, Ohio.

SEE our ad, Embossed Letter Co.

OUR device on an umbrella decides its life, guards against its loss. Clip this ad, send with 10 cents to our depositories, The Richmond Bank & Trust Co., Richmond, Virginia, for sample. Indispensable to umbrella owners. Sells at. Sight sales, \$5.00 day each. International Distributing Company, Richmond, Virginia, U. S. A.

AGENTS—Easily earn \$25 to \$40 per week selling Koo-Dan Guaranteed Bleach; direct-from-the-mill proposition; 20% better; costs less; 3c. Garwood sold \$100 worth in six weeks; send for free sample; no money required. Koo-Dan Bleachery Mfg. Co., Desk 13, Dayton, Ohio.

AGENTS—\$200 monthly distributing Newells profile cases. Sell 115 needles in book for 10c and make 200% profit. Approval Plan envelope makes taking unnecessary. New Managers write. Send 10c for sample book and particulars. Newell Company, 5509 Belmont, St. Louis, Mo.

WE offer an exceptionally attractive proposition in tube-quake, building sales agents in unorganized territory, state references and qualifications. Emcochem, Minneapolis, Minnesota.

AGENTS—Our 25c Needle Cases contain 115 assorted needles; sell like wildfire and cost you only a cent in quantities; send dime for samples and "Quick-Selling" plan. The Killer Co., 142 Federal St., Boston.

AGENTS. Cost 2c. sell 25c. Sign Letters put on white roller. Samples free. Embossed Letter Co., 2549 Milwaukee Ave., Chicago.

WE want one selling agent in each town to represent the Magic Electric Section Cleaner. This is a high grade proposition for high grade men only—that's really worth while investigating. Rosefield Manufacturing Co., 12 Abingdon Square, New York City.

YOU are looking for more long green. You doubtless deserve it, and willing to work for it. Our soap and toilet article combinations have every mark of being the real Cash Getters—you can guess that they are. Write for our convincing proofs. Davis Soap Works, 261 Davis Bldg., Chicago.

SEE our ad. Embossed Letter Co.

ILL Send You, Prepaid, a Big Set of winning mail-order plans; if accepted, 25 cents total cost; otherwise return; include 5c mailing cost. Export, P. O. Box 1413, New York.

10¢ DAILY with rapid-selling household article. Necessary in every home. Romance for Hustlers. Particulars free. Acme Sales Company, Dept. PM, Grand Junction, Colorado.

1150 A week; almost every telephone user buys one in three; sells for \$3; complete set of instructions in salesmanship free. Wizard Sales Company, Chelsea, Mass.

AGENTS—Get busy; latest invention. Fix It. Millions being sold; orders coming fast; act quick; big profit. Sample 19 cents. Eastern Specialty Co., Hoboken, New Jersey.

AGENTS—Send your address to be placed in Agents Directory. Will put you in touch with many propositions. Agents Directory, 26 Ivory St., Boston, Mass.

AGENTS make big money selling the Compressed Air and Suction Clothes Washer. Washes clothes by compressed air. A child can operate it. The air does the work. The best and the cheapest clothes washer made. It retails for \$2.50. Write for special prices to agents. Star Metal Works, McKinney, Tex.

AGENTS Wanted. Winning household specialties. Be independent. Your own boss. Large profits. Permanent connection. Catalogue 25 cents brings sample. The Scott Company, 1049 Granite Bldg., Rochester, N. Y.

AGENTS. \$5 a day easily, many make double. 40 whitebird sellers, write for free sample and catalogue. The Ideal Specialty Co., Desk M., Lock Box 525, Worcester, Massachusetts.

I WANT men and women. Let me show you how to make two hundred dollars per month selling vacuum cleaners. Success assured. Chas W. Barnes, Norwalk, Ohio.

MANUFACTURE your own goods. Our books tell how. Small capital. Big money. Cheaper free. Building, Box 137, Providence, R. I.

SMALLEST Alarm Clock, 14c postpaid. W. H. Garner, 119 South Lafayette St., Evansville, Ind.

EXCLUSIVE state representative wanted by manufacturing company; prompt shipments; no collecting; pocket sample. Universal Case Register Company, 610-15th St., Detroit, Mich.

AGENTS! \$5 a day. Samples and catalogue free. Ideal Household Dealer Co., Newport News, Va.

AGENTS—Context Portraits 65c; Frames 15c; Miller Tops 35c; Pictures 1c. Write J. E. Trahus, Fargo, N. Dak.

TRY our up-to-the-minute window letters. None "just as good." Slamm Sign System, Detroit, Mich.

VALUABLE information, write Agents & Canvasers Co., Richmond, Virginia, U. S. A.

BOYS—Earn suit of clothes, spare time. Digested clean work. Write to-day. Ellis Co., Huntington, Pa.

WANTED—Agents to sell our articles. Sells easy; more repeaters; big profits. For free particulars write to The P. W. M. Agency Co., Agents Supplies, Mequon, Conn.

CASH for names, addresses, information, etc. Steady income at home. Instructive to get for stamp. Information System, 275 Marietta, Ohio.

300% PROFIT—Hustlers send 10c for cards. Sells for \$1. Naylor 460, Ft. Wayne, Ind.

AGENTS—We are headquarters for High Grade Specialties and Business Plans. Send for literature. National Sales Co., Peoria, Ill.

AGENTS Wanted for easiest selling proposition out. Write at once. J. F. Beck-leader, R.M. Toledo, Ohio.

AGENTS here is a winner. Four to five dollars per day on a Square Deal. J. H. Slagmaker, Wyomissing, Del.

SEE our ad. Embossed Letter Co.

SEE our display ad on page 153. Doud Lighting Co.

HUSTLERS are making big money with the Fuller—the best and quickest selling line of sanitary household brushes made. Write now. Catalog free. Sample outfit. Fuller Brush Co., 32 Handley Place, Hartford, Conn.; Western Branch, Wichita, Kansas.

AGENTS and Salesmen—Just out. Stereoscopic automatic Self-Scraping Bath Brush. Uses liquid soap. Sanitary, clean, perfect. Needed everywhere; especially by travelers. Big field. \$19 day each. \$3.75 profit each sold. Handsome demonstrating sample and bottle pure liquid soap, only \$1.50. Book-let free. Burner Mfg. Co., Dept. J, Toledo, O.

AGENTS—A pair of Silk hose free this month only. Send no money, state size. Agents wanted in every town. Write today. Beautiful line. Large profits. Triple-Wear Hosiery, Dept. D, 115 So. 13th St., Philadelphia, Pa.

MAIL Order Men get quick cash returns. We manufacture and distribute new specialties. Start high class M. O. Business. Small capital. Copyrighted prospectus free. No scheme. Box N-235, Pittsburg, Kansas.

AGENTS make big money selling our new gold letters for office windows, store fronts and glass signs. Any one can put them on. Write today for free sample and full particulars. Metallic Sign Letter Co., 408 N. Clark St., Chicago.

Be independent! Start a mail order business in your own home. We tell you how, and furnish everything needed wholesale. An honorable and profitable business for man or woman. Particulars free. Many make \$3,000 a year. Murphy Mfg. Co., South Norwalk, Conn.

AGENTS: Our specialties sell anywhere. Adams Fisher Mfg. Co., 61-15, St. Louis, Missouri.

SELF threading needles. 10c a paper. Agents' samples and terms free. Ladies Art Co., Dept. 41, St. Louis, Mo.

AGENTS—Washing Dish, patented, very washable. P. Box 7, Roslindale, Mass.

AGENTS—Reporter, costs 5c sell for 50c. Sample free. Thorburn Laboratory, Peoria, Ill.

You can sell this Office Specialty—Demonstration—Not talk does it. Sell from your pocket, easy and quickly. 200% profit. Winner for side line. Particulars free. Barless Sons Company, Maumee, Indiana.

AGENTS—Men and women. Be the first to sell Only Self Oiling Map on market. Household necessity. Big money market; write at once. Eureka Sales, 110 So. Michigan, Chicago.

WE manufacture five fascinating game boards; 150% profit; orders repeat; best side line with cigars, candy, etc. Particulars. Bechtler Game Co., Independence, Iowa.

AGENTS—100% profit selling Steel Wood Dish Cleaner. Large demand. Housekeepers say, "Superior to other cleansers." Test free sample and prove our statement. Write today. P. C. Hanson, Southbridge, Mass.

AGENTS—Make \$5 daily handling our up-to-date Door Plates, Name Plates, House Numbers, Signs, etc. Samples free. Brett Bros., Boston, Mass.

AGENTS—Make \$2 each selling our wonderful luminous crucifixes; nothing to sell six a day; absolutely new; shine all night in darkest room. Pioneer Portrait Co., 1223 W. 63rd St., Chicago.

MEDALLIONS sell at night. 500 percent to 500 per cent profit. Make up your own goods and be independent. "It's easy." Catalog free. Fred Bessing Co., 1205 W. Randolph St., Chicago.

\$5 TO \$10 a day for reliable men and women agents; sample and complete outfit free; credit given; easiest, fastest, best sellers ever offered; a sale for every call. Acts of Moline, Ill., averaged near \$1 an hour; Wacht of St. Paul, Minn., working only part time, averaged \$125.00 month for six months; Still of El Paso, Texas, made \$12.50 in eight hours and says "anyone willing to work can make \$5 to \$10 a day." 400 per cent profits for you; full details free. Advertisers Door Sales Co., Dept. 85, Topeka, Kan.

HUSTLERS Agents Wanted for our fast selling Sanitary Household Brushes. Steady work. Big profits. Postal brings particulars. Dept. C. Hale & Karanek, New Britain, Conn.

WANTED Salesmen—Earn \$250 per month, sell dealers highly advertised article. Philip Co., Station L, New York, N. Y.

DIAMONDS Diamonds—Agents, everyone, to wear and sell our famous Bokora Diamonds. Write for sample offer and catalogue free. Northwestern Jewelry Co., 52 Northwestern Bldg., Chicago.

AGENTS—Our new De Luxe Steel Mantle Burner. Fastest seller on market, fits all homes. Converts kerosene into gas. Smokeless, odorless. Guaranteed perfect white light. Sample burner postpaid 2c. Lyndhurst Burner Co., Dept. B, Lyndhurst, N. J.

1500% PROFIT selling our sign letters. We'll show you how. 100 varieties; sample free. Johnson Co., Quincy, Ill.

AGENTS—Our Sun-Ray Incandescent kerosene mantle burners guaranteed, best on market; 100 candlepower light. Galban kerosene lasts 100 hours. Particulars free. Simplex Gaslight Co., Dept. P, New York.

AGENTS—\$20 weekly; we manufacture the best needle case made; a wonderful seller; 200 to 500 per cent profit; taking unnecessary; our copyrighted "Trust Scheme" envelopes do the work; general agents can make over \$100 weekly; send 10c for a 25c sample containing 115 needles; particulars free; buy direct from the factory at wholesale. Only Needle Co., 102 Union Sq., Somerville, Mass.

AGENTS—County and State; men and women everywhere to sell the Pinless Clothes Line; a practical labor saving invention. Lasts life-time. Sells on sight, gives perfect satisfaction. Agent Station of Georgia, sold over million feet; 100% profit; write quick for exclusive territory; information free; sample postpaid 2c stamps. Pinless Clothes Line Company, 520 Wilcox Bldg., Portland, Oregon.

AGENTS—We manufacture glass paper. Plain glass windows made to look like real stain glass; something new; easily applied; big money maker; two square sheets of paper, with catalogue in colors and discount sheet, for 10c. S. H. Parrish & Co., 202 S. Clark St., Chicago.

YOU can make \$500 as our general or local agent. Household necessity; saves \$0 per cent; permanent business; exclusive territory; salary or commission; free sample; credit. J. Pitkin, 113 Redd St., Newark, N. Y.

AGENTS Wanted:—Mechanics and shopmen make over \$100 a month in spare time selling transparent handled novelty knives and razors. Big profits. Sales easily made. Write for terms today. Novelty Cutlery Co., 67 Bay St., Canton, O.

500% PROFIT selling our wonderful sign letters for office windows, store fronts and glass signs; resembles finest gold leaf; easily applied; samples free. Metallic Letter Co., 408 N. Clark St., Chicago.

SALESMEN wanted: A reliable, permanent business, selling Koeth's Combination Kit, the most wonderful tool ever invented. Six pairs drop forged tool steel jaws, one pair handles makes pliers, pliers, punches, wrenches, etc. Invaluable for mechanic, farmer, chauffeur, handy man. Carrier-Koeth Mfg. Co., 52 West Street, Coudersport, Pa.

AGENTS make \$20.00 weekly selling our 500 Handy Household Articles; catalogue free. Schaff Co., 1137 Wells St., Chicago.

AGENTS: Our Columbia Folding Hand Bag is the best proposition on the market. Not sold in stores. Big profit. Write for terms and other big sellers. S. V. Diamond, 25 West 23rd St., N. Y. C.

500% PROFIT selling Gordon Photo Filter Top. High grade work. Samples and catalogue free. Leather Goods Co., Northwestern Bldg., Chicago.

WE manufacture six fascinating game boards, 100% profit. Orders repeat. Can be carried as side line where Candy, Pipes and Cigars are sold. Particulars free. **Indiana Novelty Co., Indianapolis, Ind.**

PERFECTION Pocket Adding Machine. Satisfying seller. Agents wanted. **Cincinnati Specialty Mfg. Co., Dept. R, Cincinnati, Ohio.**

STOP here! Let me start you in a home business that will bring you money every day. Experience unnecessary. Spare time. No canvassing. I furnish everything and guarantee success. Send for proofs. **Yorkshire, Desk C. R., Omaha, Neb.**

I WILL start you earning \$4 daily at home in spare time, diverting interest; no capital; send for free instructive booklet, giving plans of operation. **J. F. Redmond, Dept. 306, Boston, Mass.**

KEY tag—German silver—marked with your name and address, with key tag, 15 cents. We want you to take orders, 100% profit. We sell blank tags, silver letters, key tags, etc. **Pease, 106 Market, Winchester, N. H.**

HELP WANTED

MAKE your mechanical bent earn you a good salary. Learn a business in which you can be your own boss. A mechanical engineer of company making auto parts, will take a limited number of boys under his personal supervision. A splendid chance for a thorough training. For full particulars, address **E. J. Cox, 2188 Ogden Ave., Chicago.**

EARN \$10 to \$15 a week and hold your position besides. No canvassing. We, as manufacturers of patented just-in-season specialties, have new easy mail order plans to keep factories busy. We furnish everything. Large profits. Small capital. Experience unnecessary. If you are one of the want-to-go-ahead kind, write for our most modern (copyrighted) plans. **Swann statement, J. M. Pease Mfg. Co., 540 Pease Bldg., Main St., Buffalo, N. Y.**

YOUNG Man—Would you accept and wear a fine tailor-made suit just for showing it to your friends? Could you use \$5 a day for a little spare time? Perhaps we can give you a steady job; write at once and get beautiful samples, styles and this wonderful offer. **Hauser Tailoring Co., Dept. 798, Chicago.**

SPECIALTY salesman to sell brand new patented office convenience which fills demand never before supplied. No commission; sells at slight large profits; exclusive territory. **Elmer F. Goodwin, Sales Manager, Clarkburg, West Virginia.**

WE need capable salesmen. We pay cash commission 42 to 45 on each order. We have salesmen who have been with us over 19 years. That proves we treat them well and they are making money. If you are a good man we want you. **Wm. Wood & Company, Dept. G, 51 Fifth Ave., New York, 100 years in business.**

OPPORTUNITY: "How to Land the Job You Want." Our new 6,000 word book gives exact details. Send 25c silver. **Flyder & Co., Portland, Oregon.** Money back quick if not absolutely satisfied.

SALESMAN—For our Provident Accident and Health Policies. Premiums \$5 and \$10 a year. Exceptional opportunity for hustlers to establish themselves in a permanent business. Write now. **Dege, R. National Life Insurance Company of U. S. A., 20 So. La Salle Street, Chicago.**

LOCOMOTIVE fireman and brakeman for all railroads. \$40-\$100 monthly. Experience unnecessary, no strike. Promotion, engineer-conductor, \$150-\$200. Age 18-35, good state, weight over 135. Many positions for competent men. Hundreds employed monthly. State age, send stamps. **Railway Association, Dept. 89, 227 Monroe Street, Brooklyn, New York.**

ACTIVE salesman to represent us in every town. Steady income to right man. No canvassing. Will not interfere with present employment. **Buggles & Mee, Box 122, Sastre, Pa.**

SALESMEN to handle our office and educational device as side line. **Thomas Supply Company, Desk 4, Pittsfield, Mass.**

MEN wanted at once for fireman and brakemen, and electric railway firemen and conductors. Hundreds of positions open. Experience unnecessary. \$60 to \$150 a month. Fine opportunity for advancement. Write today for full particulars. State position you want. **National Railway Training Ass'n., A-12, Dwight Bldg., Kansas City, Mo.**

AGENTS make big money and become sales managers for our goods. Fast office sellers. Fine profits. Particulars and sample free. **One Big Pen Company, Dept. 2, Baltimore, Md.**

THE Secret of Song Writing. Booklet full of useful information by an expert. 25c postpaid. **Chas. Metz, 504 East 84th St., New York.**

FREE Illustrated book tells about over 300,000 protected positions in U. S. service. More than 40,000 vacancies every year. There is a big chance here for you, and you need not pay. Lifetime employment. Easy to get. Just ask for booklet, A29. No obligation. **Earl Hopkins, Washington, District of Columbia.**

WANTED to hear from men out of work; write today and get the position you want. **Henderson & Zabo, Lima, Texas.**

WANTED—Griffey, Brown & Sharp and Acme Automatic Sewing Machine Operators. **Potter & Johnson Semi-Automatic Lathe Operators.** Apply at Employment Department, **Westinghouse Electric & Mfg. Company, East Pittsburgh, Pa.**

PROFITABLE, steady employment, both sexes. **White D. C. Grant, 501 E. 11th Ave., Denver.**

WANTED—Distributors advertising matter everywhere. **American Distributor, Box 5418, Mount Pleasant, Pennsylvania.**

SALESMEN, two, oils, greases and paints. **Sigmet Oil Company, Cleveland, Ohio.**

PATENTS bring wealth. Proof—Advice free. **A. Wedderburn, Patent Attorney, Washington, D. C.**

WANTED—Men and Women for Government Positions. \$80 monthly. Annual vacations. Short hours. No "Japs." Common education sufficient. Over 13,000 appointments pending. Influence unnecessary. Farmers eligible. Send postal immediately for free list of positions open. **Franklin Institute, Dept. F 21, Rochester, N. Y.**

MEN and boys to learn automobile repairing, driving on up-to-date cars; electric, civil engineering, surveying. Mechanical most practical. Room and board while learning. Positions secured! Satisfaction guaranteed; nothing free. **National School of Engineering, 210 W. 7th, Los Angeles.**

MEN and Women Wanted for Government jobs. \$80 month. Write for list of positions open. **Franklin Institute, Dept. F 21, Rochester, N. Y.**

WANTED—Local or Traveling Salesman making small towns to handle our new attractive pocket dialing. Quick shipments, prompt commissions, no collecting. State territory covered. For particulars address **G. A. Johnson, 210 Bigel St., Chicago, Ill.**

WE teach you a trade in a few months' time; no expense but your work. Electricity, automobiles, plumbing, bookbinding. 100 satisfied workmen today; forty jobs going. Catalogue free. **United Trade School Contracting Co., Los Angeles.**

U. S. GOVERNMENT wants Railway Mail Clerks—City Carriers. \$50 month. Short hours. Steady work. November Examinations everywhere. Coaching free. **Franklin Institute, Dept. F 21, Rochester, New York.**

TRAVELING salesman answer this. Just side line yet. Brand new. Pays full traveling expenses. \$4 per order. Two to four orders a day sure. Consigning goods. Pocket sample. Prompt commission. **Temby Jewelry Company, 2065 S. Michigan Ave., Chicago, Ill.**

EARN your way thru college, either in the Business College, or in the Engineering College, or in the Medical College departments. Write us for particulars at once. **Logan Square College, Logan Square, Chicago.**

WANTED—Railway Mail Clerks—City Carriers. \$50 month. November Examinations everywhere. Coaching free. **Franklin Institute, Dept. F 21, Rochester, N. Y.**

WANTED—Honest men to learn Advertising Distributing. Big pay United States School of Distributing, Box 462 Pittsburgh, Pa., Dept. 3.

GOVERNMENT Wants Help. Write for list of positions open. **Franklin Institute, Dept. F 21, Rochester, N. Y.**

GOVERNMENT post office examinations everywhere soon. Get prepared by former U. S. Civil Service Examiner. Write today for free booklet. **Patterson Civil Service School, Box 820, Rochester, N. Y.**

GOVERNMENT Jobs Open. Write for list. **Franklin Institute, Dept. F 21, Rochester, N. Y.**

SALESMEN—Large returns for whole or part time selling The Rapid Vulcanizer. Sells at sight to auto owners, garages and supply stores. Write for particulars and terms. Complete outfit retails for two dollars. **Rapid Vulcanizer Co., 448 Commercial Nat. Bank Bldg., Chicago.**

U. S. GOVERNMENT wants Railway Mail Clerks—City Carriers—Postoffice Clerks. \$50 month. Short hours. Steady work. November Examinations everywhere. Coaching free. Write immediately. **Franklin Institute, Dept. F 21, Rochester, N. Y.**

WANTED—A man or woman to earn \$5 to \$10 per day. All or spare time, nothing to sell. Send stamp for particulars. **M. S. I. A., Indianapolis, Ind.**

CASH for information, games, formulas, and ideas. Steady, profitable home business. Instructive booklet for stamp. **Information System, 276 Marietta, Ohio.**

ANYONE with my new device and a few hours' study can obtain a fair knowledge of the principle involved in making and reading mechanical drawings. Models and sample drawing demonstrating this shortest method included with the device for \$1. **The S. Knapp Studio, 235 Jefferson Ave., E., Detroit, Mich.**

1944 Money Writing Songs—Hundreds of dollars have been made by successful writers. We pay 50 per cent of profits if successful. Send us your original poems, songs or melodies today, or write for free particulars. **Dugdale Co., Dept. 265, Washington, D. C.**

SALESMEN—Clear \$15 to \$50 a week selling the Guaranteed Cyclone Four Helium Ball-Beating Sanitary Vacuum Cleaner. We can use a few more good salesmen. **T. D. Keller, Mfg. Co., Waterloo, Ia.**

MEN Wanted—Particulars, two cent stamp. **Box 29, Independence, Kans.**

GO on the stage. Vanderbilt career offered you. Experience unnecessary. Managers endorse my method. Instructive hand-drawn book free. Write today. **Frederic LaBelle, 828, 10, Jackson, Mich.**

ANY intelligent person may earn good income corresponding for newspapers. Experience unnecessary. Address **Press Correspondence Bureau, Washington, D. C.**

SALESLADY wanted for Highgrade Corset, not sold in stores. Best dress, best proposition to salesladies. References. **Wade Corset Co., Station 1, New York.**

WE train detectives. You can be one. Splendid opportunities. Travel. Earn \$100 to \$200 monthly. This fascinating profession taught practically and scientifically by mail at a constant cost. **American School of Criminology, Dept. F, Detroit, Mich.**

WANTED one thousand chauffeurs and repair men. Our demand for automobile engineers exceeds the supply. Calls for men of intelligence and mechanical aptitude capable of commanding \$100.00 to \$150.00 per month upon graduation. Resident course \$29.50 to \$65.40. Home Correspondence course completed by practical road and shop work at this school, highly successful. Look this up. **Auto Schools of America, Dept. T, 1606 Michigan Ave., Chicago.**

STOP here! Let me start you in a home business that will bring you money every day. Experience unnecessary. Spare time. No canvassing. I furnish everything and guarantee success. Send for proofs. **Yorkshire, Desk C. R., Omaha, Neb.**

I WILL start you earning \$4 daily at home in spare time, diverting interest; no capital; send for free instructive booklet, giving plans of operation. **G. F. Redmond, Dept. 306, Boston, Mass.**

BE an electrical motorman—\$100 to \$1,500 a year. New field. Demand for competent motorman greater than supply. Personal, practical mail instructing qualifies you for splendid position. Graduates assisted. Write for particulars. **Fort Wayne Correspondence Schools, Dept. 20, Fort Wayne, Ind.**

WANTED—Hustling man in each locality. Join this Society. Sick, accident, death benefits. Introduce our Memberships. Start time to start. \$50 to \$100 a month. Write. **Box 1F-292, Corbin, Ky.**

WANTED, Agents, Machineists. Attention! Increase salary, new revised Saunders' Hand-Book of Practical Mechanics. Best ever ready reference. Thousands in use. Postpaid \$1.00 cloth; \$1.25. \$1.50 leather flap. Big profits. **E. H. Saunders, 216 Purchase St., Boston, Mass.**

MACHINERY, TOOLS, SUPPLIES

GASOLINE Engines, 20 hp. to 60 hp. Two, three, four cylinder, \$125 up. Marine and automobile types. Guaranteed. Universal Motors, 4150, Rear Street, St. Louis, Mo. Ferguson, Waterloo, Iowa.

9", 11", 13" BAILEY lathes, make to 32", 100 lb., 20" to 26", 36". Radial Miller, \$100. 100 other lathes, Highball Mfg. & Supply Co., Janesville, Wis.

ENGINE and dynamo wanted: capable of running for Motoring Picture Machine, also twenty-five drives. Must be cheap. John A. Anderson, Edison, Alta, Canada.

GASOLINE engine 6 hp. also 8 in. feed printer, \$115; will take small gasoline engine in trade. S. W. Alder, Forest, Ohio.

WANTED—Small Milling Machine, wood, consider Elwood type, must be good and price reasonable. Box 216, Saddle, Kans.

FOR SALE—No. 11 Star lathe, chuck and tools; good condition, \$75. Box 219, Saddle, Kans.

STEEL, guaranteed under 40'; new; cost \$54, sell \$22. E. W. Skinner, Danbury, Conn.

STEAM and gas engines, also to twenty horsepower, Wm. Rockwell, Elbert, Idaho.

PATENTS bring wealth. Proof—Advice free. A. Wedderburn, Patent Attorney, Washington, D. C.

13 LATHES for sale, \$15 to \$140 each. Send for list No. 25. Lucas & Son, Bridgeport, Conn.

WANTED—Machinist tools: cheap for cash. American Vending Machine Company, Boston.

FOR SALE—Palmer and Singer 6-hp. Motor and transmission. Dr. Fryer, Riverside, Wash.

1 H. P. ELECTRIC Motor, \$30. Brazing Forge with Heat Blower, \$18. Good order. Yost, 115 Edgar St., York, Pa.

ONE lathe 21" Swing, 12" centers. Complete. Minn. Eng. Co., 2399 University, St. Paul, Minn.

BRAND new special 30 hp. 4 cylinder, air cooled engine. Bursack at \$130. C. A. Lombardy, Springfield, Conn.

GASOLINE engine wanted, from 10 to 25 hp.; cash deal. John A. Anderson, Edison, Alta, Canada.

BARGAIN in gas engines, new and second-hand, 1½ to 30 hp. Affiliated Mfgs., Milwaukee, Wis.

30 H. P. Fairbanks-Morse, \$250. Good condition. Affiliated Mfgs., Milwaukee, Wis.

MACHINISTS, send for free treatise "How to turn up or repair a crankshaft" with Watson's combination lathe dogs. H. A. Watson, Chicago, Ill.

UNIQUE engines are small, powerful and compact. See our ad on page 115. Amateur Mechanics Supply Co.

PULLEYS, Gears, Sprockets, Shafting, Hangers; see page 144. W. A. Jones Foundry & Machine Co., Chicago.

COMPLETE saw mill outfit, comprising sawmill, planer, derrick and other equipment. A 30,000 plant at a bargain. Write me for further information. W. F. Hunt, Talladega, Ala.

50 HORSE power boiler vertical, 30 horse boiler engine vertical, \$1.25 for outfit. Pioneer, 122 Water St., New York City.

2½ H. P. steam boiler and engine, practically new, must sell at once. Will ship C. O. D. price \$50. H. B. Shooker, 1019 So. 10th St., Lincoln, Neb.

FOR SALE lathe 18" \$225. Pioneer, 122 Water St., New York City.

Gears, I have a quantity of brass gears, all sizes, on hand for sale cheap. Write also wanted. E. C. Warren, Tremont St., Webster, Mass.

FOR SALE 2 cylinder Air-Cooled Holman Gasoline Engine, 12 hp. Good condition. Price \$100. 1223 North Ave., Bridgeport, Conn.

HOW to run and repair gasoline engine; booklets and Digest one year, 25c. Has gasoline engine department. Digest, Grand Rapids, Mich.

30" or 36" MILLSTONE, large taper steam-mill \$225. Pioneer, 122 Water St., New York City.

MANITOWOC Marine Motors, 5 hp., \$62; 10 hp., \$104; 20 hp., \$180. Satisfaction guaranteed. Rough and machined castings of same for sale. Richards Engine Works, Madison, Wis.

FOR SALE—Gasoline Engine Gray Model T, new, 16 hp., cheap and we guarantee it. Baker & Baker, Royal Oak, Mich.

FOR SALE—Complete set of castings with all material to build Comet Jr. 31-hp. stationary gasoline engine with 1000 parts \$40; also machine engine sets. Comet Motor Works, 564 Jackson Blvd., Chicago.

FOR SALE—One 15 hp. gasoline engine in good running order. Has been refitted and put in best class condition. Price \$225. F. H. Waters, Jewett City, Conn.

1" Square machine vice \$200. Pioneer, 122 Water St., New York City.

BUT need apparatus and material direct from owners. Ask for what you want and Card No. 1. Electrical Supplies Exchange, Omaha, Nebraska.

CAMERON Coil and Battery, sparks gasoline engines on 4 1½ batteries. Big gasoline, enormous battery power, \$100. John Cameron, Jr., 99 Pleasant St., Easthampton, Mass.

1 CYL. 25 hp. water cooled motor \$20; 10 hp. Detroit boiler & burner \$25; 15 hp. Mason Engine \$3; Push, 284 Mass. Ave., Buffalo, N. Y.

ONE 25 hp. Atlas slide valve steam engine, in excellent condition. C. W. Dickerson, Ypsilanti, Mich.

FOR SALE—Old single, 10-hp. power Air Compressor. Cost \$200, \$250. Fine condition, \$100 immediate sale. Empire Type Foundry, 1058 Ellicott St., Buffalo, N. Y.

FOR SALE—One 30 H. P. engine and dynamo, 125 volt; one two slide planer, 26 in. Geo. J. Adams, 23 South St., New York.

We are headquarters for Machinery for sheet metal—Presses, Punches, Shearing Machines, Flippers' tools, Dies, etc. First class goods at reasonable prices. Niagara Maching & Tool Works, Buffalo, N. Y.

RENTALY Engines—We have on hand a number of rebuilt "Buffalo" engines, guaranteed at greatly reduced prices. Write for bargain list. Buffalo Gasoline Motor Co., 1250-1254 Niagara Street, Buffalo, N. Y.

ENGINE castings, 1½ horse vertical gasoline, air-cooled, 37. Three horse machine water-cooled, 7½ cash; drawings included; catalogue for stamp. Novelty Manufacturing Co., 852 West Sixth St., Cincinnati, Ohio.

FOR SALE—Gasoline engines, automobiles, marine and stationary, also castings. Second-hand ones taken in exchange and for sale. Apply with stamp. H. W. Richardson, R. No. 36, Peoria, Ill.

FOR SALE—Engine lathe, springs 9½ in. takes 25 in. between centers. Complete with full set change gears to cut all size threads, 2 to 48 in.; price only, \$40.50. Address L. P. Grammes & Sons, Allentown, Pa.

STEAM boiler outfit, complete; 1½ horse power, 20" diam., 51" high, \$40. Page Boiler Company, 815 Lawrence St., Chicago.

FOR SALE—Machinist: Throttling, Automobile and Turbine engines, boilers, pumps, heaters, machine tools, tanks, saw mills, and general machinery, at bargain prices. Let us know your wants. The Handle Machinery Co., 1761 Powers St., Cincinnati, Ohio.

SIMPLE mechanical inventions wanted; send sketch. Sanders, 22 Crilly Block, Chicago.

SEND me for booklet "How to Run and Install Gasoline Engines," and year's subscription to Gas Energy, 28 Murray St., New York.

LATHE for sale—For bargain in small lathe write South Bend Machine Tool Co., Dept. L, South Bend, Ind.

PATTERN material A book devoted to the principles of pattern and core making and molding. Written by G. H. Willard, a practical pattern maker of years experience. This book, just published, treats the subject in a much more simple, direct and effective manner than most books along this line. 224 pages, 312 illustrations. Price \$1.00 postpaid. Popular Mechanics Book Dept., Chicago.

SERIES of 7 kinesiographic models—Steamship, automobile, gas engine, steam engine, steam turbine, wireless telegraph and dynamo. Size 8½ inches. All parts of these machines are shown and numbered to correspond to printed keys of names. Price each, 50 cents, postpaid or set of 7, \$3.50 postpaid. Popular Mechanics Book Dept., 218 W. Washington St., Chicago.

TO MANUFACTURERS

WANTED—Exclusive State Agency for some new meritorious article adapted chiefly to mail order trade. Preferred. Must be something new and novel and not sold in stores. No patent modeling firm need write. Name not cash price and full particulars or no notice will be taken. C. O. Olson, Grand, Minn.

MANUFACTURERS—Let us sell your product in Massachusetts. We have an excellent selling organization. F. J. L. Co., Box 101, Pittsfield, Massachusetts.

WANTED, manufacturers to develop patents. Have several big money. Safe! auto. Box 81, Magazine, Arkansas.

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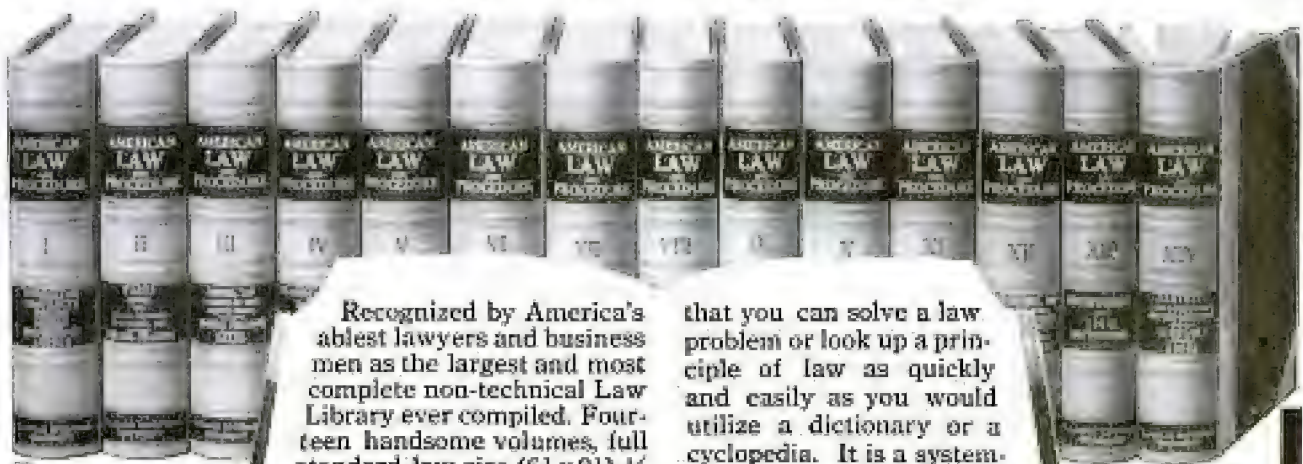
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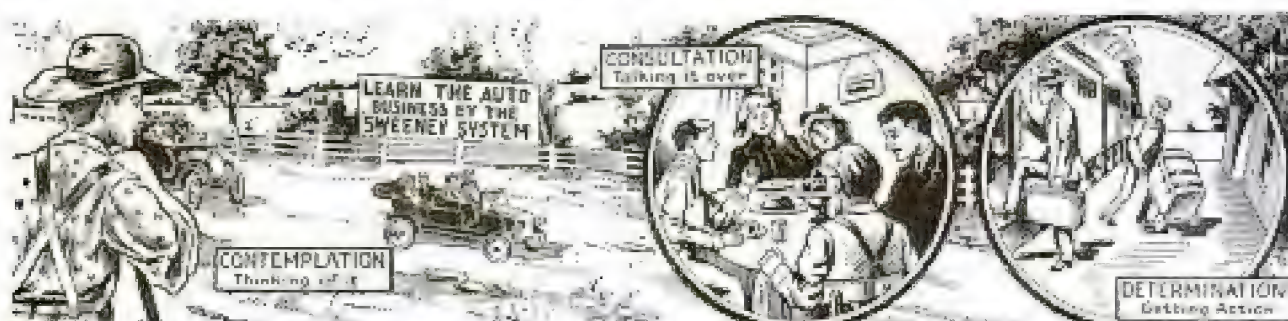
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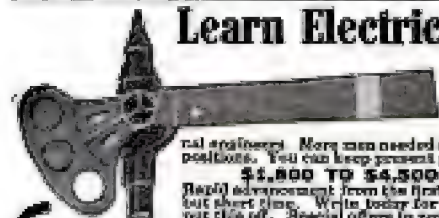
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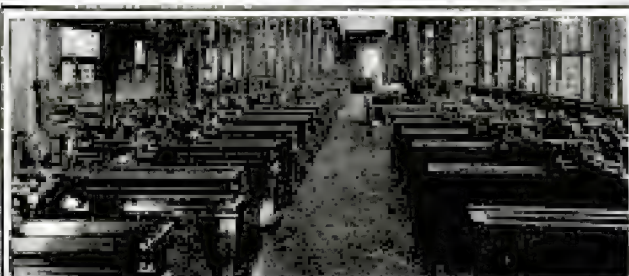
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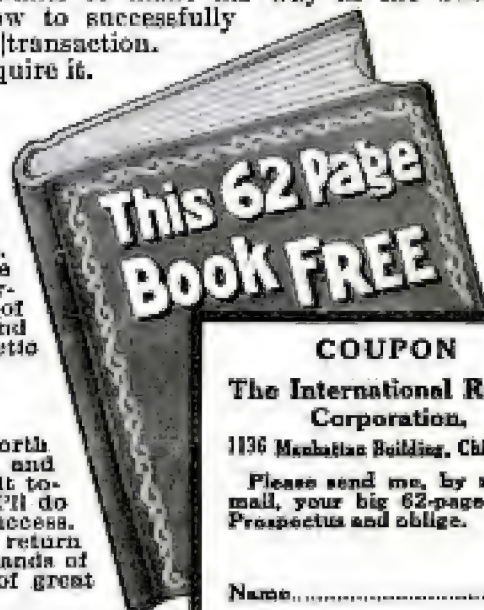
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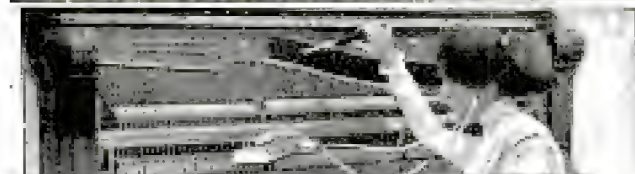
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Popular Mechanics Magazine

WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 18

OCTOBER, 1912

No. 4

The Human Body As An Electrical Machine

ONE does not fancy the human body as an electric dynamo, but if the heat and muscular energy expended by an average man of sedentary habits were converted into electrical units, he would find himself in possession of quite a valuable asset. It is proved that a man uses up about two and one-half

hours; an electric heater for 2 hours; an electric curling iron for 100 hours; run a large fan for 32 hours, or warm a chafing dish for 6 hours.

All this is accomplished without voluntary effort, and merely comes in the course of the day's work, and does not represent the energy of a laboring man. It



kilowatt hours of electrical energy in a working day. Approximately one-half of this amount is used to keep the temperature of the body constant, while the other half is expended in muscular energy.

This amount of electricity may not seem great, but when one considers the things that can be done when it is efficiently applied, the power of the human body is more clearly seen. Two and one-half kilowatt hours of electrical energy is sufficient to maintain four 25-watt tungsten lamps of 20 candlepower each for 25 hours; or heat an electric flatiron for 6 hours; run a sewing-machine motor for 100 hours; heat an electric toaster for 4



Energy and Heat Developed by the Average Man Daily, Converted into Electricity, Could Operate Any One of These Appliances a Surprising Length of Time

is an astounding revelation of the efficiency and endurance of the human machine.

Now when one sees a fat man toiling along on a hot day, he can realize that electrical energy is being generated and think of the many things to which it might be applied. But if the fat man were aware of his own ability as an electric dynamo, he would ardently wish that it could be used to run a large fan that would give him relief from the heat of the city pavement.

A "FORE AND AFT" CAP FOR MOTORISTS

A motorist's cap having goggles of the same material as the cap attached, the whole being so shaped that the



goggled section is the back part of the cap when goggles are not desired, is shown in the accompanying drawing. That is, the cap may be worn turned completely around, the portion bearing the up-folded

goggles being turned to the back when the goggles are not required.

TWELVE-PASSENGER MONOPLANE

A year or two ago when French air-men were obsessed with the desire to outdo each other in the matter of carrying live weight, several short flights were made in which as many as 12 men and boys, mostly boys, were carried. None of the machines so loaded down was designed, however, for the transportation of more than three or four passengers at the most, but a monoplane, called an "Aerobus," has now been constructed in France with a seating capacity of 12 passengers.

The monoplane in question has a 250-hp. motor and two propellers, a length of 52 ft., with a wing span of 45 ft., and a sustaining surface of about 860 sq. ft. The weight with passengers and equipment is approximately 2,580 lb. Seats for the passengers are arranged in two rows of six each.

NEW YORK'S DOUBLE-DECKED STEPLESS STREET CAR

The stepless street car, introduced in New York for the comfort of hobble-skirt wearers, has now been followed by a double-decked car of the same type, which has seating accommodations for 88 passengers, and a total capacity of 171. The new car, recently placed in service, will be the forerunner of many others of the same type if it proves practicable.

Economy of space makes the new double-decker only 17 in. higher than the present standard street cars. An arching roof with a central height of 7 ft. 2 in., gives plenty of head room in the lower compartment. Access to the upper deck is obtained by a central stairway. The seating accommodation on the upper deck consists of back-to-back benches which run the length of the car over the arch of the lower story.

On entering the car, the passengers face a conductor seated at a desk. The equipment of the cars includes an electrical street announcer and an automatic cash register.



One of the Double-Decked Stepless Street Cars Being Tried Out in New York

SUBMARINE LIGHT FOR POLICE BOAT



The submarine light has long been a practical reality, but its use as a means to help the police in their ordinary routine work was left to the Chicago Police Department. The submarine light will be part of the equipment of a new motorboat that was recently launched on the Chicago River, and will be used to expedite the work of recovering the bodies of the drowned. This will largely do away with the slow dragging method now in vogue, where the searchers must run back and forth over the river bottom with cumbersome and inefficient grappling hooks. It will also be of great assistance to the divers when they are working below the water.

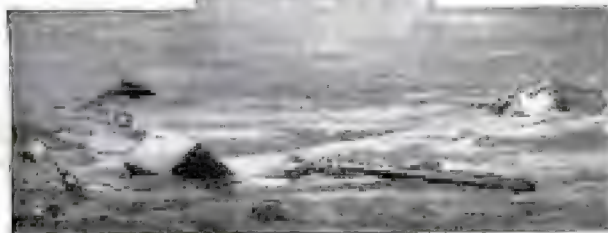
This particular light consists of a cylindrical tungsten bulb of high power whose rays are refracted through a heavy triangular prism of glass so as to light a large area on the bottom of the stream. The light is said to be of such intensity that the river bottom may be plainly visible to depths of 18 to 20

ft., and will be partially illuminated in depths ranging from 20 to 30 ft. The light is of especial value in Chicago, because of the large number of accidents that occur in the Chicago River where the water is very dirty.

The boat which carries the light is 35 ft. long and 10 ft. beam, and is supplied with a 40-hp., 4-cyl. motor capable of driving it at a speed of 15 miles an hour.

Two police crews of four men each, working on 12-hour shifts, will man the little motor craft. Day and night they will patrol 47 miles of river and 27 miles of lake frontage.

The boat is not only intended to facilitate the recovery of dead bodies—it is equipped for rescue and resuscitation work as well. In the little cabin is a hospital cot which can be drawn out from a slide in the stern. Then the seats are folded back and there is ample room to work over an exhausted person. A first-aid set is in a cabinet at one side of the cot.



Using the New Police Harbor Patrol's Submarine Searchlight to Hunt for Stolen Property or for the Bodies of People Who have been Drowned

PERGOLA FORMED OF CONCRETE TREES

Concrete was used in the garden of a home in Oakland, California, in the creation of a pergola of artificial tree



An Artistic California Pergola Formed of Concrete Imitations of Dead Tree Trunks and Branches

trunks and branches. The imitation of scaly bark and straggling limbs of old dead trees is excellent, and a few clinging vines help to deceive the casual observer. The garden is lighted at night by electricity, the electric bulbs protruding from knots in the concrete branches.

FLIES AT SPEED OF THREE HUNDRED MILES AN HOUR

The frigate bird has been known to fly between widely separated points at a speed of 300 miles per hour, according to the Maritime Review. The largest of these birds, with a weight of only 8 lb., are credited with wing spans of up to 16 ft., a proportionately greater spread than has as yet been employed in any aeroplane. When this highest speed of bird flight is equalled by the aeroplane, it will require only six hours to fly across the Atlantic Ocean by the shortest courses, from Ireland to Newfoundland, or from Liberia to Brazil. It is probable, however, that such speeds are attained even by the birds only with the aid of favoring winds.

TAG POKER: A GAME FOR AUTOISTS

"Tag poker," the fundamental rules of which are the same as in the regulation card game, as far as pairs, threes, four of a kind and straights are concerned, is a new and ingenious diversion for autoists imbued with "sporting blood."

It is played as follows: The owner of the car and a friend or several friends are out for a ride, and "just riding" has grown a little monotonous. One of the party agrees to take the tag of the first car which whizzes by, and the others in the party select other passing cars until all are provided. A car passes, all in the party crane their necks to catch the number on its license tag, and the number is duly recorded. It may be, for example, 2,838. This is the first player's hand, and consists of a pair of eights. The next player selects a car before it is near enough to ascertain the number, and the number, for instance, proves to be 1,191, which gives him a hand of three ones. The player getting the highest hand, of course, takes the pot.

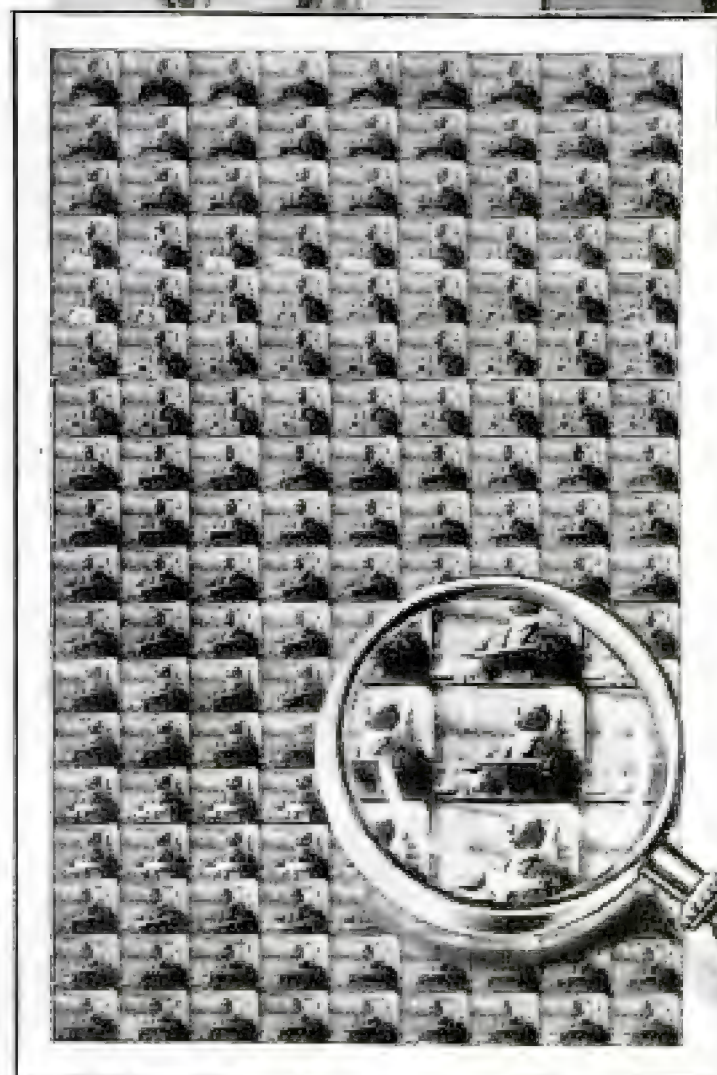
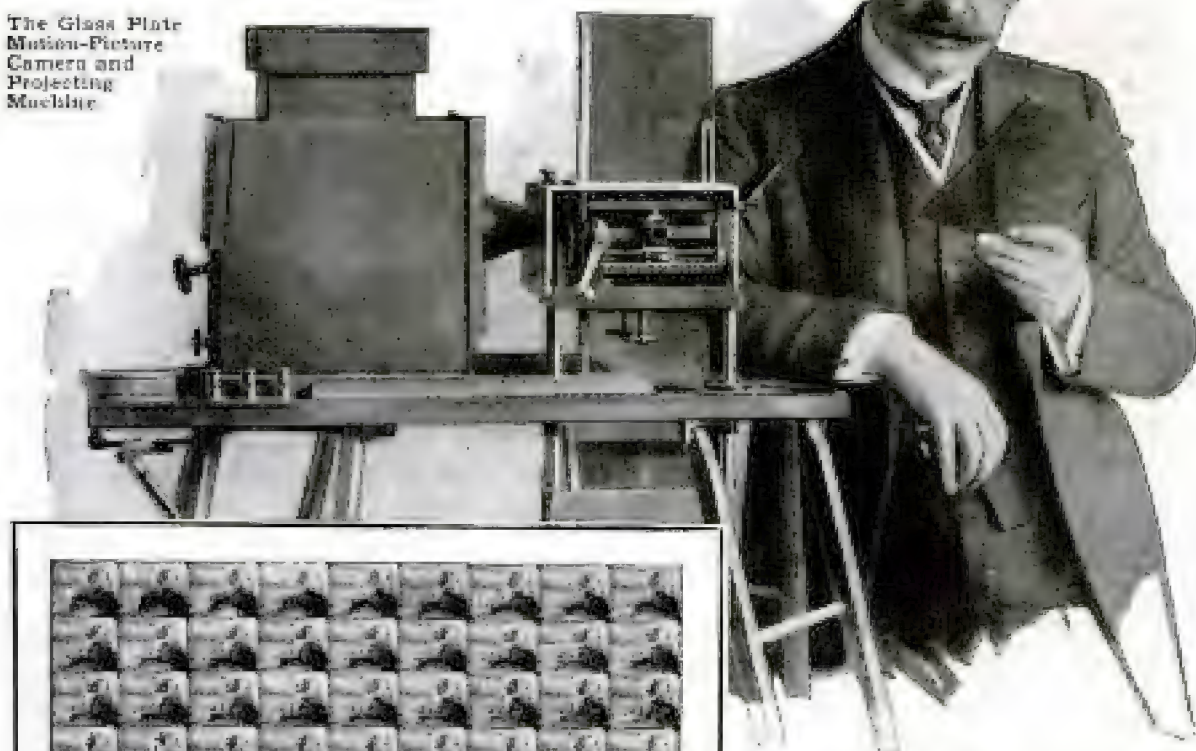
MINE-SOWING IN TIME OF WAR

The destructive record of mines in the Russo-Japanese war has resulted in this instrument of destruction coming into its own again. Several British cruisers have recently been converted into mine layers, and the next war will probably find "mine-sowing" upon the sea generally practiced. During recent maneuvers of the British fighters as many as seven mine-laying ships accompanied the fleet to sea. Six trawlers, converted into mine sweepers, as the vessels which search for mines are called, also accompanied the fleet.

MOTION-PICTURE MACHINE USES GLASS PLATES

A motion-picture camera which also serves as the machine for projecting the pictures on the screen, and which uses glass plates instead of films, the whole outfit being especially con-

The Glass Plate Motion-Picture Camera and Projecting Machine



structed for the purpose of enabling the amateur to take and display such pictures safely, is meeting with much favor abroad.

Having the appearance of an ordinary camera, the machine contains a magazine of 18 plates, on each of which 162 exposures may be made. The portions of each plate are consecutively exposed by the turning of a crank, which also operates the shutter, causing it to open and close at the proper intervals and with the proper speed to produce motion pictures. The exposure of the plate begins at the upper left-hand corner and

A Plate Having 162 Exposures Upon It, a Few of Which are Shown Under a Magnifying Glass

continues toward the right in the top row until, as is shown in the illustration, the ninth picture is taken, then the plate automatically moves upward the necessary space, the tenth view appears immediately below the ninth, and so on, row after row. When the plate is filled with pictures it is automatically moved out of the way and a new plate substituted without the least interruption. During this operation an index on the outside of the camera informs the photographer on which

plate he is working. If all the 18 plates are used, a total of 2,916 individual views will be obtained.

The developing of the plates is done in the ordinary manner, but, if containing pictures of the same series, all plates should be developed at the same time to insure uniformity.

To project the pictures, the plates are placed in the camera in their proper order, a projecting lantern is placed behind the apparatus, and the crank is turned.

COMBINED DECOY REEL AND BALANCE

A game decoy that is a combined reel and balance is the clever invention of a Chicago hunting enthusiast.



A reel of galvanized iron upon which the sinker rope may be wound, acts also as the balance of the decoy. The reel is

absolutely simple, with no chance for tangling the line, and also permits the sinker to be lowered to any depth without unwinding the whole cord, as is the case in the old-style decoys. This saves much time in setting out and picking up decoys, and does away with the irritation of cold fingers and chapped hands due to handling the rope in the usual type.

REMARKABLE AEROPLANE SPEED PERFORMANCE

Still the speed record of the aeroplane improves, the newest figure being 105½ miles an hour, set by Jules Védrines on July 15, at an aviation ground near Paris. The duration of the flight was 1 hr. 6 min., during which time there was covered a distance of 124¼ miles, measured around a course of six miles in length. One of the circuits was made at a speed of better than 106 miles per hour, and, because of the distance lost in keeping

well away from the mark towers at the corners, it is believed that the speed would have been not less than 120 miles an hour in straight-away flying. The machine was one of the new straight-winged Deperdussin monoplanes, with a pronounced streamline body, propelled by a 140-hp. Gnome motor. The new mark was set in the elimination trials to select a Gordon-Bennett racer for the competition in Chicago this fall. Prévost, Védrines' nearest competitor, made the distance at an average speed of nearly 102 miles per hour, while Frey averaged better than 90 miles per hour.

SMALLEST ROLLER SKATES IN THE WORLD

The roller skates recently made for one of the little people appearing in a midget exhibition in England are claimed to be the smallest ever made for actual use. One of the skates is shown standing on a tea cup of the afternoon-tea size, and its smallness can be readily judged, yet they are of the latest type and designed to carry their user around the stage at a considerable speed.





By
JOHN C. MILLER

AN enemy to the skyscraper has been brought to public notice in the last few months, that may result in some disaster, if means are not promptly taken to guard against it. It has an old name, electrolysis, and its results are the electrolytic corrosion of the water and gas pipes and all steel and iron bodies that are in contact with the damp earth, along which stray electric currents may travel seeking an easy way of return to their source, the power house.

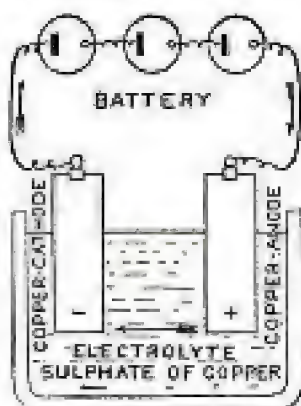
For years electrolysis has been the friend of man and until now it has been his servant. Just now it seems to be his master and has passed from his control. The brightest minds in the electrical world are grappling with the problem of protection of our steel buildings and bridges from the insidious attacks of this subtle enemy—the result of the almost universal electrification of our street railroads and power utilities.

A stray electric current having once entered the piping systems of any city will find its way to every steel structure and pipe line in that city and is farther beyond control than any epi-

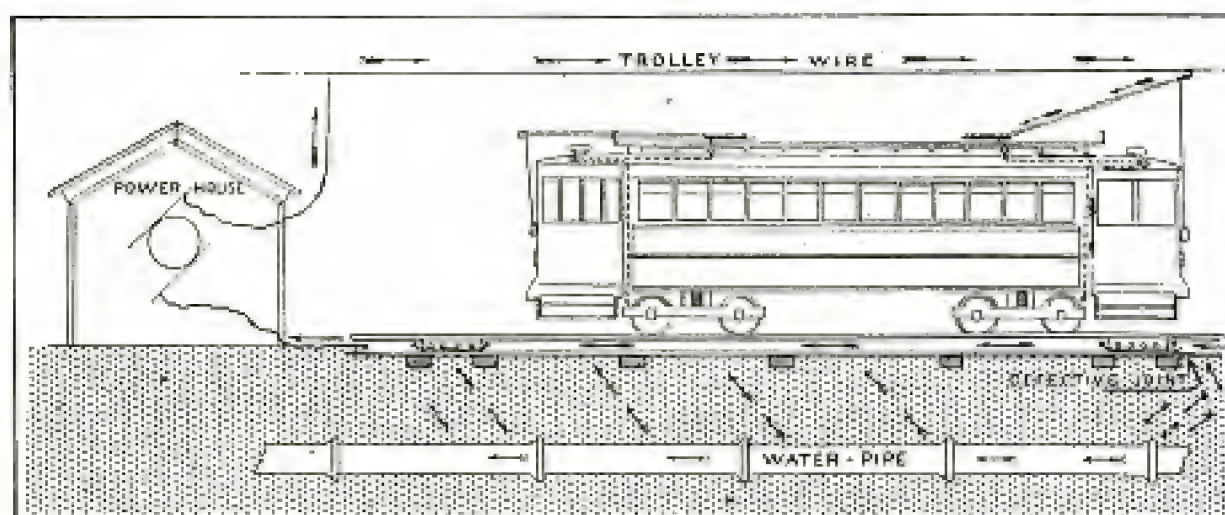
demio that may find its source in the contaminated water supply. Both may result in loss of life and damage to property.

Electroplating has been carried on for years by that quiet transfer which takes place between two metals of different electric polarity connected by a liquid, or an electrolyte as it is called. A current of electricity will always flow

from a point of higher potential to one of lower, provided a conductor connects the points, just as water will flow from a higher to a lower level through a connecting pipe. And when a current of electricity passes from one metallic body to another through an electrolyte, some of the former or positive metal is carried to the electrolyte solution and from the solution a metal is deposited on the negative or receiving metal. New metal is thus taken up by and de-



In This Arrangement Electrolytic Corrosion Takes Place Only When Current Is Supplied from an Outside Source, the Anode Being Corroded and the Copper Taken from It Deposited on the Cathode



Electric Current from Power House over Trolley Wire and Pole to Motor and Rail Leaves the Latter at Defective Joint, Jumping to Water Pipe and Back to Rail Again, Thus Causing Electrolytic Corrosion of Pipes

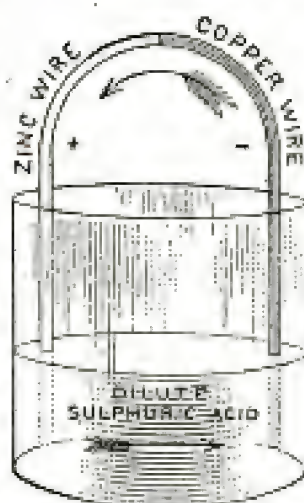
posited from the electrolyte, and the process has been called electrolysis. The two metallic substances from which the current starts and toward which it flows are called the electrodes and must be of different potential. Potential corresponds to pressure in any hydraulic system and a difference of potential, measured in volts, produces a flow of electric current.

The flow is always from the positive to the negative pole in any system of conductors and electrolytes, and corrosion takes place only at the point where the current leaves the metallic body, that is, at the positive pole.

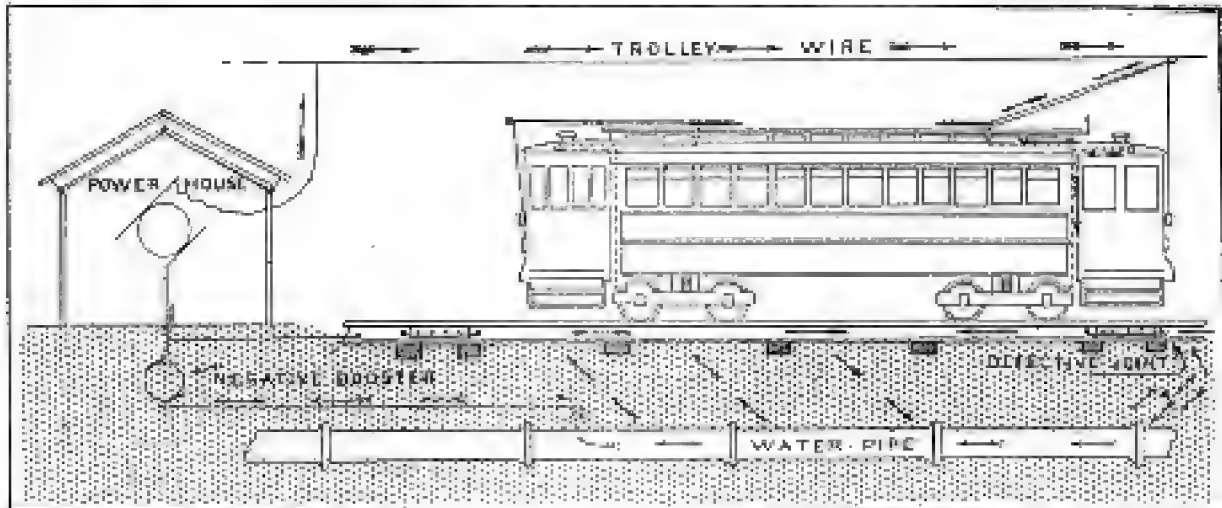
The electric current that gives rise to corrosion may be generated in several ways. It may be the result of chemical decomposition as in a battery itself, or it may be produced far away from the locality where electrolysis takes place, as is the case in cities where the source is the power house of the street railroad or power system. Here the current starts out from the positive brush of the generator, goes through the overhead trolley to the motor of the car where it does its work and returns by the rails, but if, perchance, it meets an imperfect bond or

rail joint, it leaves the rails and jumps to the water pipes through the damp earth. When it leaves the pipes and jumps to the rails again, iron is carried along with it. It is to the stray currents jumping from one conductor to another of different potential that damaging electro-corrosion is due. Chemical dissociation always takes place where the current leaves the conductor and at these places the greatest damage is done.

The rate at which iron is carried from an electrode has been known for years, the amount depending upon the strength of the current and not upon the voltage, and is equal to slightly over a gram (about 15½ grains) for each ampere hour the current passes. Four hundred and fifty amperes will therefore carry a pound of iron from a water pipe into the damp soil surrounding it per hour. Concrete is a much better conductor than damp earth and it is not imagination to say that pounds of steel are being carried from the bases of the steel columns supporting our high office buildings to the damp earth and concrete in which these bases are buried. In a series of tests recently made in Chicago, it was shown that 251



Current-Generating Cell, in Which Electrolytic Corrosion Takes Place Spontaneously, the Zinc Becoming Corroded and Its Lost Parts Deposited on Copper Wire



"Negative Booster," One Remedy for Electrolytic Corrosion, But Incomplete as Saving Only That Part of the Piping behind the Connection to the Booster, Stray Currents Leaving the Pipe at Preceding Joints.

amperes were flowing out of a State Street building over a 3-in. gas pipe, a 6-in. water pipe, and from the steel of the building to the tunnel rails, connection having been made between the latter by a copper cable. The maximum voltage found, as shown by the recording voltmeter, was eight volts. At the same time indications were to the effect that sometimes no less than 475 amperes flowed out of the building in one hour, or, in other words, that electrolytic corrosion would be eating away the steel which came in contact with the damp earth at the rate of over a pound per hour.

The water and gas-pipe man is well aware of the current his pipes are carrying, for sparks will occur when he severs a pipe, leaking gas will be lighted in the trench when pipes are broken, and shocks to his system by the currents he interrupts have become a common thing with him. A voltmeter will indicate a difference of potential and electrolysis surveys are being made by many of the more progressive cities. While the

laws of Faraday, formulated years ago, stated the amount of iron deposited by an ampere hour, the results have often been questioned.

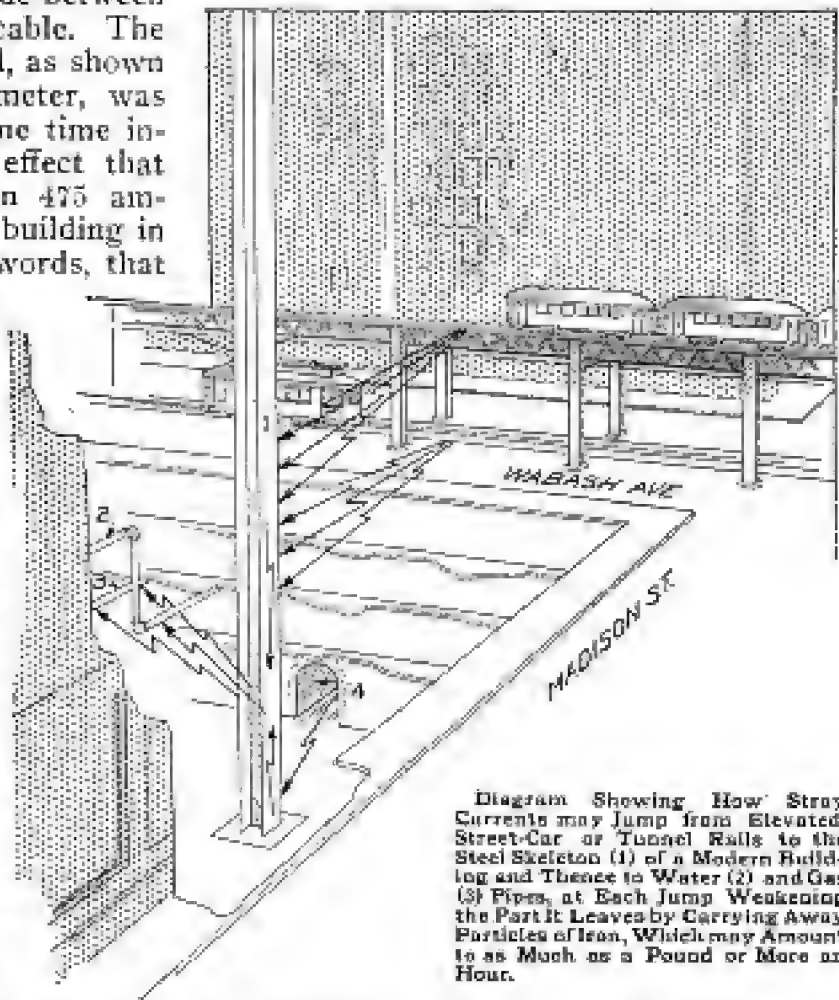
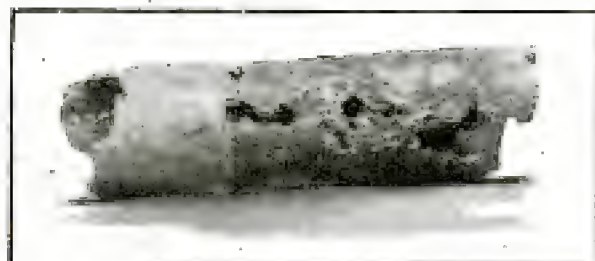


Diagram Showing How Stray Currents may Jump from Elevated, Street-Car or Tunnel Rails to the Steel Skeleton (1) of a Modern Building and Thence to Water (2) and Gas (3) Pipes, at Each Jump Weakening the Part It Leaves by Carrying Away Particles of Iron, Which may Amount to as Much as a Pound or More an Hour.

Recently, however, extensive experiments have been carried on at

Stevens Institute of Technology, Hoboken, N. J., with various pipes buried in damp soil, and the conclusions have been reached that the amount of corrosion is at least equal to and generally greater than the



Four-Inch Cast-Iron Water Main, Ruined by Electrolysis, Taken Up at Richmond, Va.

amount given by Faraday (1.04 grams per ampere hour). It was also determined that the loss is independent of voltage and that less than one volt can produce corrosion. Cast iron is less liable to corrosion than wrought iron or steel. In these experiments soil of two kinds was used and the work was carefully conducted over a long period.

Several remedies have been proposed to counteract this corrosion and all are in use in various cities with varying results. The vital point in them all is to prevent the jumping of the current from the metal to the damp soil. The most natural remedy is the overhead return for the current, which system is in operation in Washington, D. C. Here a double trolley wire is used and no current enters the rails or escapes to the earth. A great increase in cost of installation and a lack of convenience in operation goes with this remedy, and street-railway companies are naturally opposed to it while the water and gas companies favor it.

A second method is by a current-

drainage system whereby a metallic connection is frequently made between underground pipes and the return rails, so that the current has a low resistance path to follow and will traverse this return cable rather than jump from the metal to the soil. In this method the steel work of a building is connected to the water pipes by a large cable and the pipes are connected to the rails so no large potential is allowed to accumulate, and no jumping takes place from the steel to the concrete footings and the damp soil.

A third remedy, and the one proposed for Chicago, is the "negative booster," in which the potential in the pipes is reduced by mechanical means. This system is in use in Glasgow, a generator being installed for every 1,000 amperes' output of the feeding stations, and cuts the difference in potential down to less than a volt, which in a great measure overcomes this corrosion. This measure is an expensive one to install and is not a complete one, making conditions worse in pipes not connected with the system.

The alarm over electrolytic corrosion is not new, but has recurred at intervals since the electric railroad came into use. Each time stronger evidences of its work have come to light and have demanded attention. The damage to water and gas pipes have compelled attention to remedies. No examples of great damage to steel structures are obtainable, but certain it is that the conditions are right for this eating away of supporting steel, in contact with damp soil, for it is likewise true that great currents are traversing these columns, and common safety and prudence demand protection against this enemy of modern civilization.

LENDING DISHES AS AN ADVERTISING SCHEME

An ingenious method of advertising adopted by the gas company in Baltimore, Md., is the lending of dishes for ladies' luncheons, church affairs, and

lodge and society entertainments at which refreshments are served. The emblem of the company, which is a shield bearing the words "Cook with

Gas," appears on each dish. Paper napkins, bearing the company's emblem are also provided.

This clever publicity idea is said by the officers of the company to be very effective, and one which is greatly appreciated by patrons. The dishes lent by the company were made to order and consist of white hotel china. They include 200 large and 200 small plates, 200 individual butters, 200 medium-sized cups, 200 saucers, 400 vegetable dishes, 60 large and 36 small bakers, 200 fruit saucers, 200 individual meat dishes, 36 large meat dishes, 60 covered sugar bowls, and 60 cream pitchers.

A set of such china can be bought at an outlay of a few hundred dollars, and the expense of a necessary supply of paper napkins is very small. Breakages, which are comparatively few, are replaced immediately, by the company.

DUTCH SAND YACHT

Sand sailing is a sport more or less enthusiastically indulged in on the beach of the North Sea near Scheveningen, Holland. The four-wheeled sand

A Racing Sand Yacht on the Dutch Coast



craft are schooner-rigged, carrying a regulation mainsail having reefing points for shortening sail in stormy weather, and two staysails.

BASEBALL APPLIED TO BILLIARD TABLE

A new amusement device, which adapts some baseball ideas to a spe-



Playing the New Baseball Game on a Billiard Table

cially arranged billiard table has just been placed on the market. On top of

the table, in the relative positions ordinarily occupied by baseball players on a regular diamond, there are miniature figures of players over a series of pockets. The face and sides of these pockets are cushioned and are so designed that the balls enter the pockets quickly and quietly. On either side of the table and in the rear, there are pockets indicating "singles," "triples," "home runs," and "fouls." The batter's box is near the front of the table where an average-size billiard ball is placed and then caromed off a triangular rubber home plate which is mounted on a spindle. This plate revolves when hit by the ball, giving the player a constantly changing shot which makes the game very scientific.

A BARN BUILT OF WORLD'S FAIR WRECKAGE

On Cottage Grove Avenue, just beyond the southern city limit of Chicago, is a barn which owes its curious

A Barn Built of Odds and Ends of the World's Fair Buildings



appearance to the fact that many odds and ends of the Chicago World's Fair buildings contribute to its make-up. The windows belonged to one of the German buildings. The top of the structure is used as a pigeon roost.

ARTICLES GLOW IN ULTRAVIOLET RAYS

Interesting experiments with the ultraviolet rays recently were made by a German physicist which he relates in a report made to a society of physical experimenters. In conducting the experiments he made use of an improved "filter," evolved by himself,—a device which excludes almost entirely the visible rays of the spectrum. Among the noteworthy effects produced was the glow or fluorescence exhibited by certain substances used by the experi-

menter. The majority of substances, in fact, shine when acted upon by the ultraviolet rays. Porcelain and metals, when free from oxides, are among these. The human body, also, is fluorescent under the influence of the light. Bluish-white light is radiated from a paper or linen screen when either is placed in the cone of ultraviolet rays in a dark room. This is defined not as the "color" of the ultraviolet rays, but as a secondary light, which is proved by the fact that if a sheet of white porcelain is placed before the screens, the porcelain does not shine similarly, but bears resemblance to black velvet. The surface of a hard boiled egg, cut in two and exposed to the rays, shows varied colors. The shell shines reddish-white, the "skin" bluish-white, the albumen citron-yellow and the yolk dark yellow. The muscle tissues of a veal cutlet appear brownish-red, the gristle an intense blue-violet, the bones whitish-blue, the fat yellow and the sinews and skin white. Very marked fluorescence is exhibited by the human body. Frequently the hands appear whitish-blue, dark hair shows gray, and the lens and cornea of the eye and the natural teeth a bright whitish-blue. The unnatural white of false teeth becomes black. Rouge or other preparations on the skin are betrayed by the rays. Artificial gems may be distinguished from the genuine by aid of the mystic light. Differing types of glass have various forms of fluorescence. The entire mass of paraffin wax is disclosed in intense blue. Practical use of the luminescent analysis, it is believed, will be found in mineralogical and botanical research work.

TILTING CONTESTS ON THE WATER

Water tilting is a sport enjoyed in many countries, our own included, and is usually one of the most interesting of the minor features of water carnivals. The illustration shows a tilting contest in the swimming tank of the

Bath Club, which is the fashionable swimming club of London. The boats used for tilting are flat-bottomed punts, each of which carries a paddler as well as a "water knight." The tilters are dressed in a costume reminis-



A Water Tilting Match in the Tank of Bath Club, London's Fashionable Swimming Organization. The Paddlers are Driving the Boats to the Attack



cent of "ye olden times," while the paddlers are in ordinary bathing suits. The tilting lances are long limber

staves bearing a ball of soft material at the end. The tilter who first succeeds in forcing his opponent into the water by either pitching him into the water from the boat or by upsetting the boat wins the bout.

The type of boats and lances used in tilting differ somewhat in different countries, and even at different clubs or swimming organizations. Water tilting in France is often done in the open, and even on the river Seine. In a recent tilting match held there, the

wielders of the tilting lances stood on platforms erected on the bows of long rowing barges, which were driven to-

ward each other by as many as six rowers to a boat. The tilters carried shields with which to protect themselves from the lances, and ward off the blows. Water tilting in America

is usually done with light canoes, one man paddling the canoe and the other standing as best he can in such an insecure craft. Quite often both canoes upset at the impact of the lances.

ELECTRICAL HEATING PAD FOR EAR AFFECTIONS

Inflammatory affections of the inner ear are accompanied by intense pains, which cannot easily be relieved except by continuous application of heat. Hot-water compresses are not very efficient, because of the necessity of changing, but by means of the electrically heated pad, a recent German invention, constant or graduated heat can be applied continuously for any length of time. The heating element is inclosed in the ear pad, and in order to vary the heat, two lamps are connected into the circuit, which by a special switch can be arranged either in parallel or in series, and one or both entirely excluded.

MONOPLANE STANDS ON ITS HEAD

While making a flight at Norwalk, Ohio, with a monoplane of his own construction, Ralph Cole met with a peculiar accident in which the machine figuratively stood on its head without doing itself or its operator any damage. The monoplane tipped up while on the ground.

¶Ledgers discovered at Palos, Spain, indicate that the voyage of Columbus which resulted in the discovery of America cost \$7,500.

¶The moving-picture machine has invaded the sacred precincts of the Vatican in Rome, the Pope having been recently entertained with a moving-picture show.

TIGHTENING ONE'S BELT TO REDUCE HUNGER

Investigations recently completed by Prof. Rudolf Lennhoff, to ascertain in what manner constriction about the body in the region of the stomach lessens hunger, have, according to reports published in German papers, led to the interesting result that the plan sometimes followed by hungry tramps and others, of tightening the belt is the correct and scientific manner of accomplishing the desired result.

Metallic substances were mixed with solid food, such as potatoes, and fed to men. The X-ray revealed that a contraction of the stomach took place and a relatively small quantity of the food proved sufficient to satisfy the appetite. When liquid food was given, the contraction was considerably less and a larger quantity was necessary for satiation. Another experiment, in which the liquid food was introduced through a tube, showed that twice the quantity was required to produce satiety. The conclusion was that the stimulus of swallowing by reflex action caused contraction of the stomach and produced a lessened sense of hunger. This suggested that

artificial pressure over the stomach by means of a belt, a common expedient of the tramp, might produce the effect, and this proved to be the case. In order

to eliminate the effect of suggestion, the experiment was tried on insane persons who were allowed to eat as much as they pleased. During the experiment they ate less, satiation occurring sooner.



A Monoplane That Tipped Up on End without Damage

A MONUMENTAL STAIRWAY UP MONTMARTRE

The last vestige of the old Montmartre district of Paris, which has been inhabited from times immemorial by the Apaches and rougher element of Paris, and, lately, also by art students and followers of art who tired of the old "Quartier Latin" or were driven out of it by extensive municipal changes, will soon have disappeared. The final link in the scheme for the beautification of the heights which bear the name "Montmartre," is the construction of a monumental stairway up its side from the public square which flanks its south declivity.

The stairway will lead to a "Chateau-d'Eau" (water palace), below which will be a circular garden planted with trees. The water palace will contain three fountains and have a roof garden on its top.

The cost of the improvement is estimated at \$500,000. Exceptional difficulties have to be met in the construc-



Courtesy L' Illustration

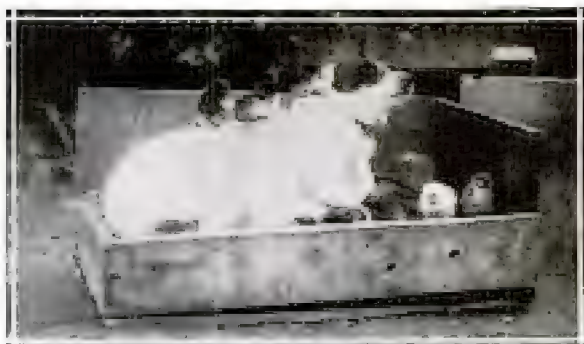
The Monumental Stairway and Water Palace on the Side of Montmartre, Paris



tion of the foundations, due to the lack of solidity of the soil in this portion of the hill.

TERRIER ADOPTS A BROOD OF CHICKS

An odd example of maternal affection displayed by a dog toward a brood of incubator chicks comes from



A Fox Terrier Contentedly Allowing Her Adopted Brood of Chicks to Cuddle under Her Body or Perch Upon It

Long Beach, Cal. The fox terrier takes care of the brood like a motherly old hen, trying to keep them warm with her body and being most solicitous that they do not stray away. Any attempt to handle her adopted family, is resented by the dog, and when a chick succeeds in straying away she lifts it tenderly in her mouth and brings it back to the box.

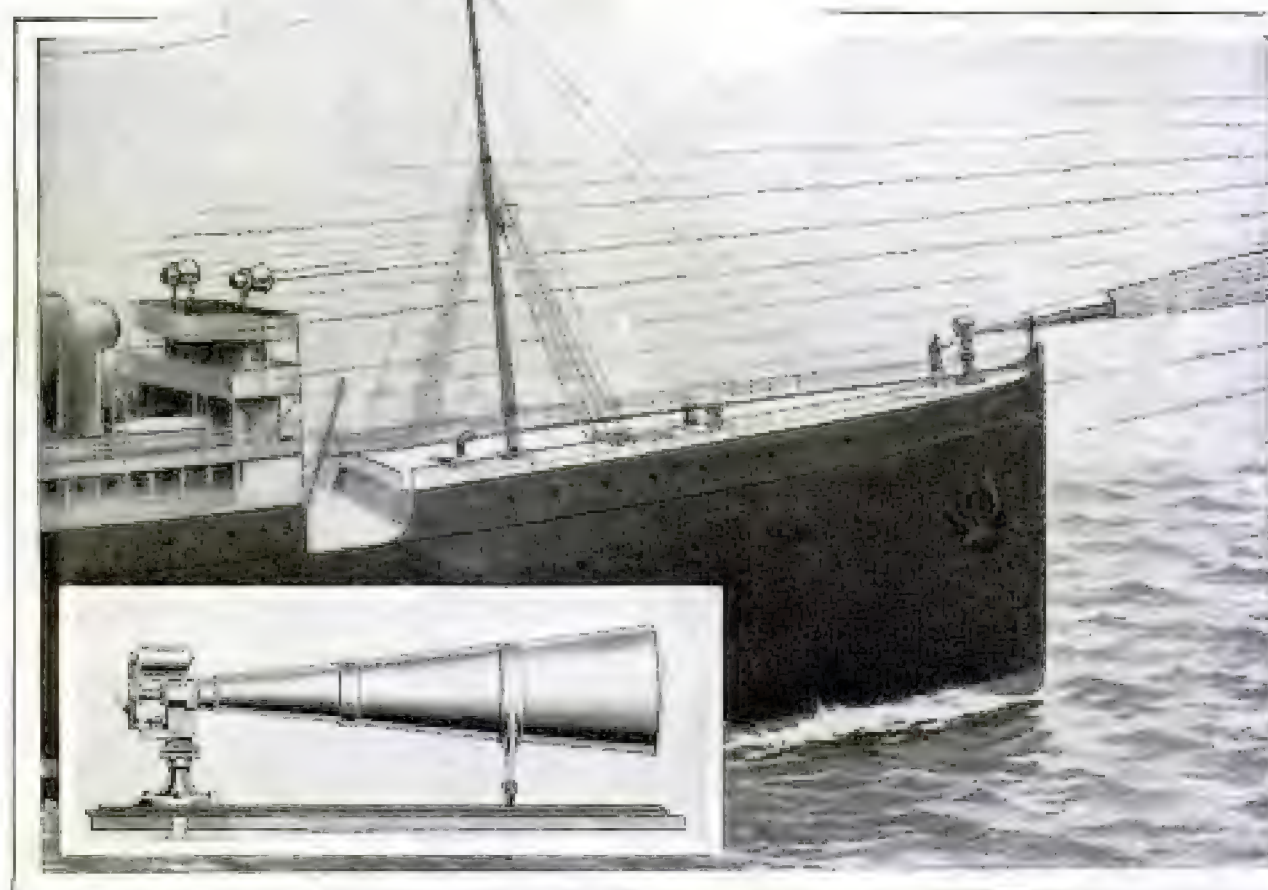
¶The Royal Society of London, or "The Royal Society for the Improvement of Natural Knowledge," as it was called in its charter from King Charles II, celebrated the 250th anniversary of its organization in London, July 15.

OCEAN SHIPS TO HEAR THE PRESENCE OF ICEBERGS

Taking his lesson from the bat, which has the faculty of avoiding obstacles in a degree of darkness that renders eyes useless, Sir Hiram Maxim proposes to equip ships with a mechanical apparatus which will perform a function of like nature.

"When a bat flies about in total darkness, the beat of its wings," says Maxim, "sends out a series of pulsations or waves. These waves strike against all surrounding objects, and are reflected back and received by the sensitive organs which form a part of the bat's face. The extremely delicate nature of the wings, together with the sensitiveness of these organs of a 'sixth sense,' enable it to judge the distance to any object by the lapse of time between the sending and the receiving of these very faint waves."

The apparatus Maxim has devised to provide ships with this same sixth sense, mechanically, comprises a device for producing and sending out the necessary air waves; another, for receiving back the reflected waves and making them reveal their presence by ringing bells, and a third, for recording the amplitude of the waves. The first consists of a modified form of siren, using high-pressure steam, and producing powerful air waves having a frequency of 14 or 15 vibrations a second. Waves of such low frequency cannot be heard by the human ear, but, being of great amplitude and power, they will be able to travel great distances, and on striking any object will be reflected back in the same way as sound waves, though the echo will be as inaudible as the primary vibrations. The siren would be provided with a trumpet mouthpiece and be so mounted that it could turn in any direction.



The receiver, which may be considered as an artificial ear, consists of a diaphragm of rubber and silk, about 4 ft. in diameter, stretched tightly over a drum-shaped cylinder, and so arranged that the air pressure would always be the same on both sides of it, irrespective of the blasts from the siren. The vibrations set up in this diaphragm by the reflected waves are caused to close a series of electrical circuits, each containing an electric bell of different pitch. Feeble waves, such as would be reflected from a large object at a considerable distance, or small objects near at hand, would cause only slight vibrations of the diaphragm, and thus would close only the first electric contact, thereby ringing the first or smallest bell. Larger and nearer obstructions would close a second contact and ring a larger bell, and so on, thus giving warning of danger.

The recorder, forming the third part of the apparatus, is simply an arrangement to give a written diagram of the disturbances of the air.

UNUSUAL COMBINATION OF TRACTION METHODS

The harbor board of Altona, Germany, recently solved a difficult transportation problem by combining old and new traction powers in an ingenious way.

Merchandise discharged at the port had to be transported over two roads of rather steep grade. The only available wagons were horse-drawn, and the task soon proved beyond the horses. The difficulties were overcome by installing a trolley line and coupling a trolley-tractor in front of the line of horse wagons; and the unusual train easily negotiated the hill. The pole of the tractor is flexibly attached so that the train can get out of the way of meeting traffic, the roads being trackless.

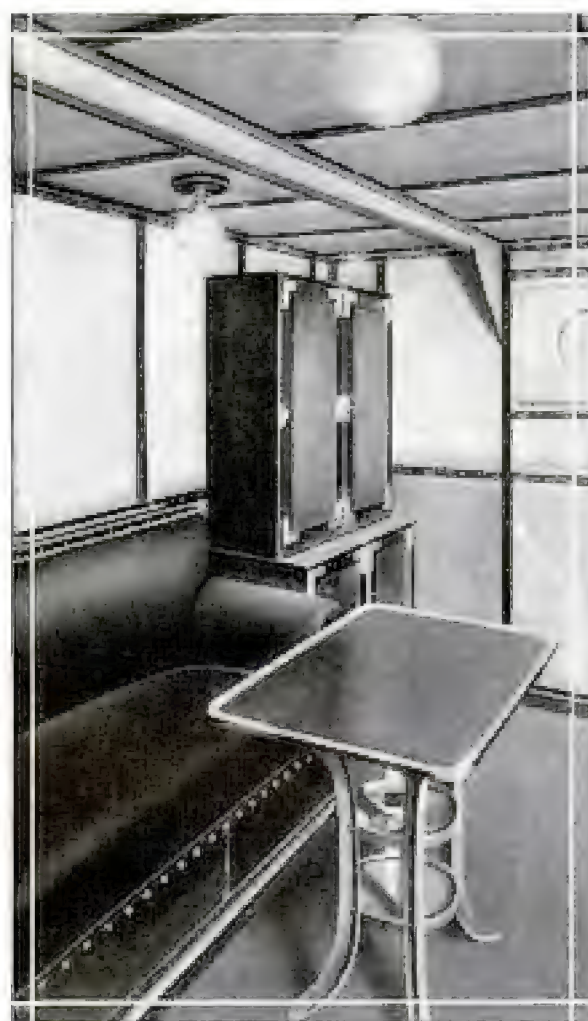
The system is now a permanent institution and trolley-tractors thus convey some 200 loaded horse wagons daily, averaging 5 to 7 tons in weight, up the incline.



The Air-Wave-Producing Siren Mounted on the Bow of an Ocean Liner and Sending Out Vibrations at the Rate of 14 or 15 per Second. When These Waves Strike an Iceberg or Other Obstruction They are Reflected Back and are Caught by the Ship's Mechanical Ears, Mounted on the Bridge. The Insert at the Left Shows the Wave-Sending Siren, and the Insert at the Right One of the Mechanical Ears.

ASBESTOS FURNISHINGS ON GERMAN BATTLESHIPS

Asbestos has recently been introduced into the German navy as a material for the interior finish of cabins,



Officer's Cabin of a German Warship Furnished with Asbestos Furniture, and with Walls, Ceiling, and Even Picture Frames of the Same Material

passageways, and the like, and as furniture. It is said to combine the advantages of wood and iron without having their drawbacks. It is as cheap or cheaper, and its chief feature is, of course, that it is absolutely unburnable.

In one of the illustrations is shown an officer's cabin done completely in asbestos, the walls, ceiling, furniture, and even the picture frames being of this material. For the sake of appearance the asbestos has a facing of very thin, polished wood, which may be finished in any color desired.

Tests have shown that the facings of wood will not burn when exposed to a hot flame, owing to the nearness of the asbestos.

The asbestos walls will transmit neither sound, strong vibrations, dampness nor heat. The use of it in construction work and furniture making is said to present no difficulty, as it can be sawed, planed, drilled and nailed like wood.

HYDROELECTRIC POWER FOR PANAMA CANAL

The surplus water at Gatun Lake will be used to supply electrical energy for the Panama Canal Zone, the hydroelectric station being situated adjacent to the north wall of the Gatun spillway. The building will be constructed of concrete and steel, and will be of a design suitable for a permanent power house in a tropical country. The dimensions of the building are such as to permit the present installation of three 2,000-kw. units, and provision is made for the future installation of three additional units of similar capacity as they are required.

From the storage in Gatun Lake, there will be available sufficient water to warrant such an installation. The average head throughout the year will be approximately 75 ft., the elevation

of the tailrace being about 8 ft. above sea level. During the rainy season, water will be plentiful and must be wasted over the adjacent spillway. Even during the dry season water will be extremely abundant for several years, until such time as the traffic through the canal approaches full capacity.



A Cabinet Made of Asbestos Faced with a Thin Layer of Polished Wood

IMPROVED METHODS OF "PEARL FARMING"



Pearl Divers Going to

A progressive son of Japan has worked out the most efficient way of producing "culture pearls" at a profit while scientists of Europe and America were still studying the question. He is a Mr. Mikimoto and the pictures show some of the activities at his pearl-oyster farm off the island of Tatokuyia in the bay of Ago. With the aid of scientists of the Imperial University,

Work at the "Pearl Farm"

adaptation of an old idea. Then he secured government patents on his method and has just now placed the farm on a commercial basis.

This unusual farmer makes a bed for his crop, first in the shallows of the bay where the larvae of the pearl oyster abound during the months of July and August. He merely deposits a large number of small stones to which the oyster spat naturally attach themselves. Then his



Japanese Women Divers Classifying Pearl Oysters

Mikimoto spent several years in costly experiments before he developed his diving women transplant the young oysters to deeper waters to protect

them from the cold. Here they lie on carefully prepared beds until in their third year they became full grown, and have firmly attached themselves to the stones by means of "necks" which they secrete.

At this time the diving women bring the mollusks to the surface and they undergo an operation. A small seed pearl is introduced into the center of the shell. Then the oysters are replanted in the bed and left alone for four years. When they are again brought to the surface it is found that the seed-pearl nucleus has been covered with many layers of "naore," a secretion of the mollusk, and the large brilliant translucent pearl of commerce has been formed.

But the process is not as simple as it appears. During the seven years that the farmer must wait for his crop to mature, a large percentage of the

oysters die. The oyster beds are raided by such enemies as the octopus and the starfish. Occasionally the "red current" sweeps over them and in a day destroys the entire crop. At all times the farmer must keep his oyster bed free of "miruno," a seaweed which will smother the crop.

Women divers trained from girlhood to long immersions in the sea are engaged at 20 cents a day to care for the farm. In this work they wear nothing save a head cloth, a white shirt and diving goggles. At each dive they can gather several oysters and return to the surface. A dive occupies about one minute, and a day's work is from four to six hours. An expert can readily gather 500 oysters a day in a depth of water ranging from two to six fathoms. To keep at the work for a day, they must frequently come up and warm themselves at a fire.

AUTO SIGNBOARD ANNOUNCES AEROPLANE EVENTS

It is often difficult for spectators at a big aviation meet to keep track of the different entries and know just which airman and machine rises at a certain

time. The officials of the Paris-Amiens aerial race, which was recently run in France, however, evolved a system of notifying spectators in which an auto-



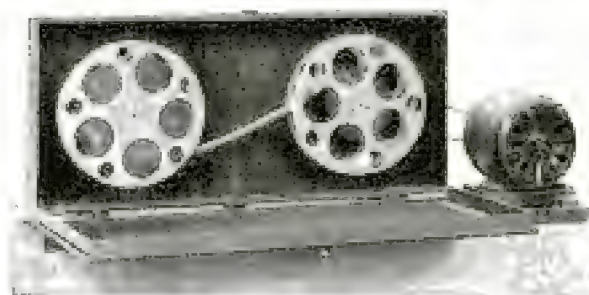
An Automobile Signboard Used to Announce Events at a French Aviation Meet

mobile played a prominent part. When a flight commenced, the name of the airman or airmen, the type of aeroplane, and the time the flight started, were marked on a blackboard which was displayed in an automobile driven along the line of spectators.

FIREPROOF MAGAZINE FOR REWINDING FILMS

A rewinding machine for motion pictures that is absolutely fireproof is the latest patent of a large film-manufacturing company. The machine consists of a magazine of $\frac{1}{8}$ -in. seamless sheet steel, 30 in. long, 15 in. high, and 3 in. wide, inside of which are placed the two film reels. When the door of this magazine is closed and latched, the motor pulley may be started and the film rewound without any danger of fire. The motor is $\frac{1}{10}$ hp. and will wind 1,000 ft. of film per

minute at a cost of three cents per hour for electricity. The film so rewound by power is tighter and more



View of the Fireproof Magazine for Rewinding Motion-Picture Film, with the Door Open, Showing the Interior

regularly wound than when it is drawn up by hand, thus lessening the number of scratches that are so objectionable in a "rainy" film.

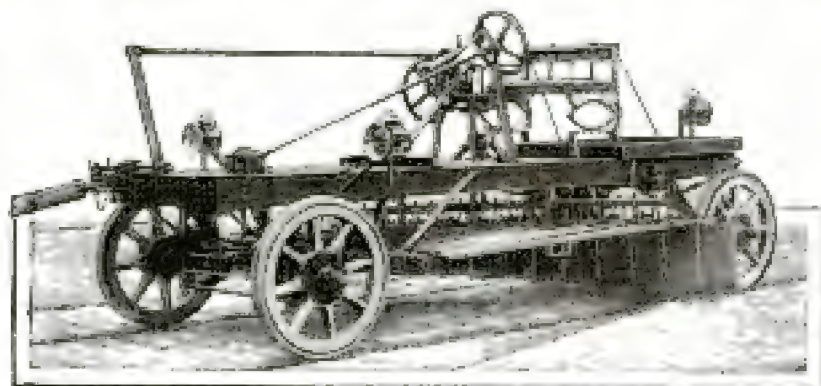
The machine is of such a convenient size that it may easily be put in the operator's room of the motion-picture theater.

TROLLEY-CAR-DRAWN PLOWS CLEAN STREETS

Clearing the snow from Vienna streets in which electric street cars run is accomplished by attaching two ingenious trailer-plows to a plow-equipped trolley car. The plow of the trolley car throws the snow into the path of the first trailer, the first trailer throws it into the path of the second, and this pushes it into the gutter at the edge of the pavement, thus cleaning the street from the track to the curb in a single operation.

An idea of how this is accomplished may be gained from the accompanying illustration of one of the trailer plows. The front drawbar of this trailer is attached to the extreme right side, so that the trailer will run, not directly back of the trolley car, but at one side, the path of the

two barely overlapping. The drawbar of the second trailer, which is likewise attached to it at the extreme right side of the forward end, is connected to the left rear end of the first trailer. Each trailer is provided with steering gear and wheel similar to that of an automobile, so that the operators of each can steer them to just overlap the



One of the Trailer-Plows Used to Clean Snow from Vienna Streets

track of the preceding plow, and also guide them around obstructing traffic.

PRIMITIVE DRAW BRIDGE IN CHICAGO

The demands of a congested population have forced the engineering department of the city of Chicago to resort to pioneer methods of bridge building. At Indiana Street on the north branch of the Chicago River a bridge is operating daily which seems clumsy and ridiculous when compared with the new steel structures only a few blocks away, but which satisfactorily serves its purpose.

This bridge connects the Italian section of the city with a market section where the fruit and vegetable

venders get their supplies. When the old bridge went to pieces the United States war department refused to let the city build a temporary structure until money was appropriated and a contract let for the new bascule bridge. However, the demands of the people interested in having some kind of bridge at that point finally prevailed, and permission for a temporary structure was granted.

The Indiana Street bridge shown in the picture accommodates 1,600 pedestrians daily. It is swung on the average of once every half hour to permit the passage of vessels. A cheap pine scow supports one end of the bridge and by paddle wheels carries the end around each time the river must be cleared. The other end of the bridge rests on a

turntable. An electric motor is the operating mechanism. The bridge tenders have found that the paddles of the



Views of the Curious Draw Bridge over the Chicago River, Showing the Bridge Closed, the Scow Which Turns the Draw, and the Method Followed in Opening It





One of the Latest French Monoplanes, Having a Solid Steel-Tube Body

pontoon are too low in the water and are raising them 18 in. If the pontoon could be allowed to float without ballast this would not be necessary, but in order to make the floor level of the bridge correspond with the level of the approach several hundred pounds of water must be carried in the pontoon. The control of the motor and of the bilge pump is placed in the bridge tender's shelter on the floor of the bridge.

Contractors are now engaged in placing the abutments and substructure for a new \$201,000 bascule bridge a few feet upstream from the temporary bridge. It will be 18 months before the superstructure contractors complete the bridge. It will have a span of 140 ft. and a roadway sufficiently wide to accommodate street-car tracks and sidewalks. Meanwhile residents of the district must leave a street car on one side, walk across the foot bridge and take another car to their destination. A similar temporary bridge is in operation a few blocks away, at Chicago Avenue.

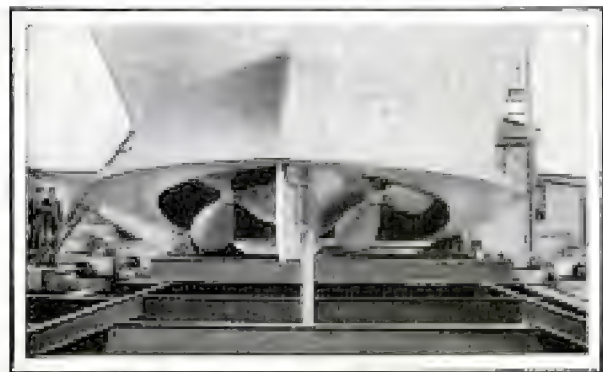
MONOPLANE WITH SOLID STEEL-TUBE BODY

The latest Morane-Saulnier monoplane has a body constructed as a solid steel tube, which tapers down to a few inches in diameter at the tail.

The streamline effect is said to be exceptionally good. The machine has two seats, arranged tandem fashion, and is driven by a 100-hp. engine.

LARGE SHALLOW-DRAFT MOTOR CRUISER

A cruising motorboat, 82 ft. long and weighing 90,000 lb., yet only drawing 30 in. of water when running at full speed, has been constructed for a Minneapolis yachtsman for cruising in southern waters. The construction is novel, in that it combines a tunnel stern with a yacht upper body. The tunnel construction of the stern, with the twin propellers in place, is shown in the illustration. One of the particular features of the construction of the stern is the so-called "chine" piece, an awning-like projection from the hull which extends well under the water line over the propellers and prevents



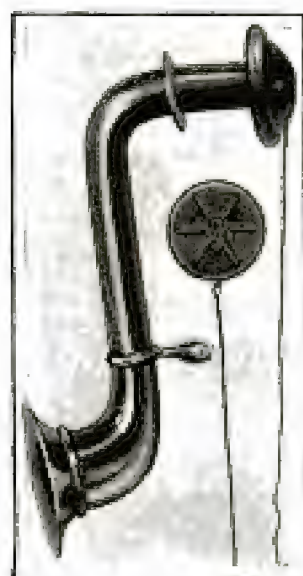
The Tunnel Stern Which Makes an 82-Ft. Motorboat Draw Only 2½ Ft. of Water

floating debris from being sucked down and tangled up in them.

With the ordinary type of motorboat of 40 ft. or more it is practically impossible to reach the most interesting parts of Florida, owing to the shoal water.

A LOUD-SPEAKING AUTO TELEPHONE

A particularly loud-speaking telephone outfit, by means of which the occupant or occupants of a limousine



automobile may give directions that will be heard by the chauffeur even though pronounced without raising the voice above the conversational pitch, is shown in the accompanying illustration.

The sound-receiving end of the instrument is a little disk suspended within a pocket of the upholstery of the car, and is connected by wire to a powerful reproducer affixed to a horn-shaped megaphone. The apparatus may be connected to any 6-volt battery.

FLIES HIGHER THAN TOP OF PIKE'S PEAK

At Leipzig, Germany, on July 7, Hellmuth Hirth set a new aeroplane altitude record by ascending to a height of 4,420 meters. This is equal to 14,501 ft., and beats the previous record held by Garros, by 1,673 ft. That this sort of flying places mountain climbing rather distinctly in the shade, will be appreciated when it is realized that Hirth soared higher than the top of any mountain in the United States, with the exception of two or three in Alaska.

CULTIVATING A FLY-KILLING GERM

Swatting, tanglefoot fly paper, traps, poison, and other methods and devices for catching and killing the ubiquitous fly, will soon be things of the past, if the new fly parasite, just discovered, proves as deadly as its discoverers believe it to be.

This new hope of carrying to a successful end a war of absolute extermination against the fly is found in the discovery by two English physicians, Drs. Edgar Hesse of Brunswick Park, New Southgate, and S. Monckton Copeman of the Local Government Board, of a microscopic fungus or mold, so small and so fatal to flies, that if one fly is inoculated with this germ, and then set free, an epidemic disease will spread among flies to such an extent that the insects will die by the thousands and literally drop "like flies" in all directions.

This germ is so small that when planted in gelatin or "agar"—a sort of gelatinlike moss—the colony does not become visible until billions of descendants have developed from the mother mold, which only requires some hours, and then the multitude only appears as large as a pinhead.

It suffices to barely touch this colony with a sharp needle and then scratch a few live flies with its point. When set free, these inoculated flies will cause an epidemic and contagious malady among their kind that will, according to the English scientists, stop short of nothing but complete annihilation.

The microbic mold is harmless to human beings, dogs, cats, and domestic animals generally. It is therefore easy to handle and results in no damage to anything but these winged pests.

Although it is too late this year to expect much successful experimentation with this new fly disease, government bacteriologists have ordered many test tubes full of these fly killers, and hope before next year to have completed trials of the microbe on the American houseflies.

SEARCHLIGHTS TO GUIDE FISHING DORIES

Electricity is now rendering a little less dangerous the operations of the fishing fleets of the North Atlantic coast, whose men brave perhaps more dangers than any other class of workers. An electric searchlight—a modification of the well-known electric automobile searchlight—has been installed upon almost every vessel of the Gloucester and T-Wharf fishing fleets, and although these lights have been in operation less than a year they have already been instrumental in saving several lives.

The searchlights take the place of flare torches on the vessels, and as the



With a Brilliant Beam of Light, Dory Fishermen on the Dangerous Grand Banks may Now be Guided Safely Back to Their Schooners.

new devices are powerful enough to pierce the thickest fog or darkest night for a long distance, and at the same time are small and light enough to be carried by hand from place to place about the vessel, it can readily be understood that they are of great value. By long experience the fishermen have come

to know that fog is their principal enemy. A study of the long list of disasters of any past year will quickly prove that the majority of deaths and accidents have been caused by single fishermen straying off in their dories in the fog. As a rule a fisher-

man leaving in his dory, even in thick, foggy winter weather, carries nothing with him but his trawl lines. He has been off alone in a dory perhaps a thousand times, and has returned to his vessel in safety. He may leave his vessel in clear bright weather, and before he finishes his work, which sometimes takes him several miles from the schooner, a thick bank of fog may have surrounded him, cutting him off from all communication with the rest of the world. If he is an experienced fisherman, he may be able to tell from the direction of the wind, from the flow of the waters and from a sort of sixth sense, which old seadogs seem to possess, where his ship lies. There is but one thing to do—take his oars and row. And many a time the doryman will row in the wrong direction. He may circle around his schooner for hours, for days in warm weather without realizing his proximity to it. Cases have been known where dorymen passed almost beneath the bowsprit of their vessels and still were not picked up. His chances of reaching his vessel are even lessened by the fact that while he is endeavoring to row toward the schooner, the latter has hoisted sail and is sailing in a circle trying to find him.

In recent fogs where dorymen have strayed off in this fashion, Capt. Matthew Greer and other well-known skippers have found that by playing their searchlights over the waters and keeping their vessel in the same spot, the rays from the light have reached the dorymen and guided them toward the schooner.

Next in importance to the question of the single doryman and the fog, the disaster list shows that collisions with other craft, especially with freight steamers, figure. Upon the Grand Banks of Newfoundland, where the European passenger steamers ply back and forth, this form of accident is common, although since the general introduction of searchlights upon the large passenger-carrying boats, the number of such accidents has grown less. It is figured that by the introduc-

tion of searchlights aboard the fishing boats which frequent these grounds, it will be possible for the fishermen to give timely warning of their presence by simply throwing their searchlights to the bridge of the oncoming liner in time for the latter to slightly alter its course.

Coming out of Provincetown Harbor of a dark, misty night this spring, Captain Greer, standing on the quarter deck of his schooner, the "Mary B. Greer," suddenly heard the sound of a steamer's propeller slashing the waters nearby. With the sole exception of this sound, the exact whereabouts of which it was impossible to gauge, there was no means of knowing that a steamer was in the vicinity. Grabbing his searchlight, which lay on the wheelbox beside him, Captain Greer switched on the current. He was in the nick of time, for a minute later the prow of a good-sized steamer which was rapidly approaching would have cut through his vessel amidships, with the result that the ship would have been a total loss and most of the men probably drowned. As it was, the light, soaring upward, filled the eyes of the commanding officer on the bridge of the steamer, who immediately changed his course enough to avoid collision with the smaller craft.

Capt. Enos Nickerson, out on Georges Banks with his new schooner, the "Pontiac," of a dark night recently, had his main topmast carried away by a sudden gust of wind. The topmast, broken off close to the mainmast, hung down in the main rigging, hindering the navigation of the vessel. In the old days the only thing to do would have been to light a flare-torch and send a man aloft with it, a process which more than once resulted in a serious fire aboard fishing boats. But under the new order of things Captain Nickerson had only to switch on his searchlight, which, turned upward, flooded the whole upper rigging with light and enabled two of the seamen to quickly cut loose the broken topmast and put the ship in navigable shape.



Photo by E. J. Press Bureau

Hunting in a Preserve Backed by Tall Buildings and Ending the Hunger of a Stray Mongrel with a Bullet

MAN PRIVILEGED TO HUNT IN NEW YORK PARKS

The privilege to hunt in New York parks, although the game is very humble game indeed, with the exception, once in a while, of an eagle, perhaps, and quite often a big hawk, is granted to only one man. This man is Arthur Hassler, a sharpshooter of the National Guard, now in the employment of the Department of Parks. He has been commissioned to kill off the homeless dogs and cats, and to protect the swans and other waterfowl, sheep and privileged live stock from the attacks of hawks and rats.

The "official hunter of the parks"

has no fixed "beat," but goes where the game is most likely to be found. In the early morning he may be, perhaps, prowling around the upper part of Central Park stalking cats. In the afternoon he will probably be seen silently watching the rocking sides of the lake, waiting for a chance to put a bullet into one of the numerous rats which make life miserable for the swans and ducks. Or he may be found watching the skies for the appearance of one of the great hawks which come soaring over from the Jersey side in quest of a meal in Central Park.

SKYSCRAPER STYLES OF 1912

"Impressive as the cliffs of Toledo," is the phrase used by a prominent architect in describing how Michigan Avenue, in Chicago, would appear if its skyscrapers were designed as large-scale compositions of line and mass, without recourse to the conventional styles, each building harmonizing with its neighbor. A new school of archi-

itects, believers in this style of design, is now coming to the front in smaller buildings, and it is only a question of time when these architects will invade the skyscraper field. In the meantime architectural details and ornaments are Classic, Romanesque, Gothic or Renaissance, according to the preference of the architect or owner,—and a city



Municipal Building, New York, Top, on Left; Woolworth Building, New York, Highest in the World, Top, Right Center; Both of These Structures Now being Nearly Completed.

Wells Fargo Building, Portland, Oregon, in Center of Page; Union Central Life Ins. Co., Cincinnati, at Right of Page; Continental and Commercial National Bank, Chicago, Lower Left Corner.

L. C. Smith Building; Seattle,
 Tower Building at Top of
 Page; Whitney National Bank
 Building, New Orleans, Top at
 Right Center; Hoge Building,
 Seattle, Upper of Two Build-
 ings on Right.



Maryland Casualty Company Building,
 Baltimore, on Left; Front View of
 Whitney National Bank, New Orleans,
 Lower Center; Woodmen of the World
 Building, Omaha, Lower Right Corner.



street is a jumble of all these styles. But, broadly speaking, certain principles are coming to be recognized, and the buildings being erected this year show a decided advance in the adoption of these principles by architects generally. When the construction of skyscrapers first began, architects were at a loss to devise a style of treatment suited to what was called "a building set on end." Bruce Price, a New York architect, conceived the idea of designing such buildings in a way analogous to a column—that is, as base, shaft and capital. This treatment is now generally followed. The base is usually three stories in height, with strong horizontal lines, and serves to break the vertical effect of the middle or shaft section. The capital, or architectural attic, serves the same purpose at the top of the building. In the middle section the vertical lines are accentuated. In this way the building forms a complete composition, having a beginning, a middle and an end.

Another tendency shown in skyscrapers now being erected is the tower, divided into stories and utilized as rentable space, resting on a building that would be a skyscraper without it. The Woolworth building in New York City, the highest office building in the world, is an example of this style of treatment. In this type of building, the attic of the main structure is less prominent than in the other type, and the top of the tower is strongly developed in order to terminate the vertical lines.

Lots of ordinary size in the congested districts of New York and Chicago are now sold as high as \$18,000 a front foot. With land at this price the skyscraper is a commercial necessity. The erection of a skyscraper increases the value of the land it occupies as well as that of adjacent land, and it is impossible to guess where the limit of height will finally be placed. A thing often discussed is the limit of height on account of the increasing space required for elevator service. This limit, whatever it may be, is not even ap-

proached in buildings of large ground area now being erected. A leading elevator company estimates roughly that one square foot of elevator area is required for each five hundred feet of office space. Twenty high-speed elevators are sufficient for a building twenty-two stories high and covering half of a city block, while twice this number might be installed without serious loss of floor space. The limit is not now imposed by the elevator service. But there is a limit due to the darkening of the streets by excessively high buildings. Even this may be overcome by building these structures as stepped pyramids, as is now proposed, each tenth story being set back from the line of the stories below, the whole rising a hundred stories or more into the air and terminating in a central tower. The skyscraper of 1912, large and imposing as it appears at the present time, may seem insignificant 20 years from now.

--- **PANAMA CANAL ZONE POPULATION**

The census of the Isthmian Canal Zone, taken the early part of this year, shows a total population of 71,682 persons. Of this number 8,872 were employees either of the Canal Commission, of the Panama Railroad, or of contractors, and, while employed in the Zone, resided in Panama and Colon. Of the 62,810 actual residents of the Zone, 19,413 are white, 31,525 black, 10,323 mixed, 521 yellow, 378 Hindoos, and the remainder Indians.

The census of 1908 showed a population of 50,003. Strange as it may seem, Great Britain leads in the present census with 30,859 persons, if classified by citizenship. The United States, which is second, has 11,850, of whom 9,770 were born in the United States.

 Lieut. Chandenier, of the French army aviation corps, was burned to death while flying in his machine the latter part of August.

DEVICES USED TO CREATE INSIDE FOOTBALL

By THOMAS KIRBY

While much has been written of the recent development of "inside" baseball, the intricate game of the highly skilful players, comparatively few of the thousands who attend the annual football games each fall know of the many difficulties experienced by trainers and coaches in priming players for these gridiron classics.

Each season witnesses new contrivances which are used as aids to the mentors in helping to ground their charges in the rudiments in the most

check the forward progress of the shoulders. The ball is passed to a back who plunges forward, but instead of ducking his head and simply "bucking," the player is forced to keep his eyes up, lest a slight movement of the ropes, held at each end by other players, will mean the driving of his head solidly against the leathers, instead of going through the square.

The object of this device is to teach backs to "pick a hole" when they are called upon to carry the ball through an opposing line, instead of going blindly into a mass of players.

The charging fence is simply a loose pole between two uprights. The posts are about four yards apart and under the cross-



The "Bucking Strap" Designed to Teach Football Players to "Pick a Hole," in the Defence

strenuous of all inter-collegiate sports. The tackling machine, a suspended dummy which is tackled by candidates before the regular practice each afternoon, and the charging machine, a sled with uprights and crossbars against which the linemen plunge to develop a fast "charge," were among the earliest inventions. The success which attended their introduction led to their universal adoption.

Now comes the "bucking strap" and the "charging fence." The former consists of two parallel pieces of leather or canvas, connecting two stretches of rope. The square, formed by the leathers and the ropes, is large enough to allow the head of the player to enter and at the same time small enough to



The "Charging Fence," a Device Which Enables a Football Coach to Give Instruction in, and a Team to Learn Accurately the Value of the Low Charge against a Formidable Lineup

bar two lines of candidates for the forward positions are pitted against each other.

The fence is considered the last word in drilling linemen to charge low.

The ball is snapped and both lines start forward. The lower the man goes, the better are his chances, for, once he get under an opponent, he is able to rise and shove his rival's head or back against the crossbar. This means the man lower is praised and the one higher is condemned by the coach who appreciates the absolute necessity of having a fast, low line, not

only on the defense but on the attack as well.

Under the rules that go into effect this fall, the distance to be gained each down will be less than in the past few seasons, meaning there will be an especial premium on ability of backs to

"pick holes" in the line when advancing the ball, while the line, in order to stop quick plunges, must play lower than has been the order since the modern system of play followed the revolutionary changes in the rules of a few years ago.

TELEPHONE INSTRUMENTS MASQUERADING

In one of the loud-speaking telephone outfits manufactured in Paris and designed to be used for commu-



nication within the house, the instruments are hidden in flower vases, which may be placed on the dining-room table, on a table or mantel in the living room, or in the bedrooms. The receiver and microphone are mounted in the base of the vase, a small plug and a flexible cord

serving for the connection with the battery. A push button rings a bell in the kitchen or servants' rooms, and the woman of the house can transmit her orders without having to call the servants to her.

There are several variations of the idea, such, for instance, as an ornamental dish holder, or an odd-looking ornamental figure.

HYDRO-AEROPLANE ATTEMPT UPON CHANNEL FLIGHT

Despite the fact that the English Channel is only 21 miles wide, and that it has been crossed not less than three-score times by aeroplanes, its historic importance as the means of preserving the insularity of Britain is so great that each new record for crossing it

becomes news of world-wide interest, a source of much satisfaction to the flight enthusiasts, and the cause of a not unreasonable apprehension to the British newspapers. The latest thing in the channel-crossing line is in the way of a prize that has been offered for the first hydro-aeroplane to get across. Already there have been placed on record, in addition to Louis Blériot's never-to-be-forgotten first crossing, the fastest crossing, the first round-trip flight, the first biplane crossing, the first crossing with a passenger, the first crossing by a woman, the first crossing by a woman pilot, and the flight with a maximum number of passengers—three, so far. As yet, however, there has been no crossing with a hydro-aeroplane, though one of these machines has already made an unsuccessful attempt, but when the feat is achieved, it will have at least the importance of being the first use of the new air-water craft for definite travel across water.

AUTOMOBILES FOR NAVAL LANDING PARTIES

The Naval Militia of California recently demonstrated the possibility, under certain conditions, of using automobiles to transport landing parties. A crew of 33 officers and men, and a one-pounder weighing 800 lb. were transported from Los Angeles to Pasadena in 21 min. The gun, which was mounted on the tonneau of the largest of the three cars, rode perfectly. This car also carried the officer in command and the gunners. The second car carried the caisson and 10 members of the crew, and the third car carried 13 men.

MIDGET ACTRESS HAS CAR OF UNIQUE PROPORTIONS

One of the smallest "little people" on the American stage, known as Princess Victoria, has an automobile built to fit. The machine as a whole, however, is not miniature. It is just the coupe that is built to fit, and the reasons are as follows: In the first place this little person requires, as do all successful actresses, a car driven by a regulation chauffeur, and there are no regulation chauffeurs of a size that could ride comfortably in a car built in proportion to her own scale. In the second place her requirement is for a car that will travel fast, and with a dignity which a really small car could not very well provide. And in the third place, her footman, who must ride on the rumble seat at the rear of the coupe, is 7 ft. tall.

Princess Victoria, who is 23 years old, 25½ in. tall, and weighs 25 lb., has to have special means of reaching the running board of her machine and then getting "upstairs" into the coupe. A toy folding yacht companionway,

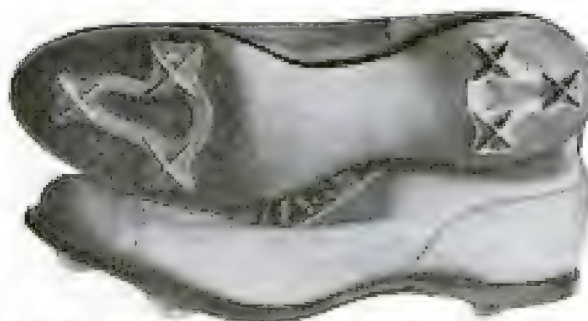


The Big Automobile with a Little Coupe Used by Princess Victoria of the "Little People." She is Shown Looking up at Her 7-Ft. Footman

which folds up under the running board when not in use, suffices for the first part of the climb, and a little set of steps mounted on the running board against the rear mudguard completes the stairway.

A NEW SPIKE FOR BASEBALL SHOES

A new type of spike for baseball shoes, claimed to be a great improvement in that it will not tear the flesh of any player it comes in contact with, is here shown. The shape of the new



Baseball Shoes Equipped with Spikes That Will Not Tear the Flesh

spike plate is like that of the old, being triangular, but the spikes proper comprise two semicircular blades of metal crossing at right angles. This

eliminates the points and each end guards the other when it comes in contact with the player's flesh or clothing. Tests are claimed to show that this form of spike is no more liable to fill up with soil than the old type of spike, as the blades are perpendicular and both edges are beveled. Next to its non-cutting qualities, the main advantage of the new spike over the old, lies in the fact that it always has the same hold on the ground at any angle.

Telephone statisticians have found, by investigation and comparison, that the average London telephone operator consumes 5.1 sec. answering a call and 28.6 sec. in getting connection with the number wanted, while in Chicago the corresponding averages are 3.1 sec. and 25.4 sec., these averages being based on 50,000 calls.



LARGEST AND MOST NOVEL WORLD WAS ERECTED



A Scene During Regatta Week, with Commodore Pugh's 40-Ft. Hydroplane Shown at the Left. A Section of the Aquatic Grandstand, with Its Rows of Enunciators, is Shown at the Right. The Dotted Line Indicates the Cable Connecting the Enunciators with the Judges' Boat

A remarkable aquatic grandstand, and the method adopted to keep the vast audience informed of every detail of the races, were features of Chicago's regatta week, August 10-17. The regatta was held to draw the attention of Chicago to the fact that it has a lake fit for small craft, both sailing and motor-driven, as well as for large steamships.

Half a mile out in the lake, and running parallel with Grant Park, which is the very center of Chicago's lake front, is a government pier, which forms the outer breakwater of the harbor. Upon the top of this breakwater, for a stretch of nearly half a mile, were erected grandstands, facing out into the lake, and having a seating capacity of between 15,000 and 20,000 persons. Several passenger boats transported the spectators from the mainland to these seats, in front of which the speeding hydroplanes flashed past at times almost as close as do racing horses in the big ring of a circus. In

each section of seats, mounted as shown in the illustration, were placed automatic enunciators, connected up by wires and cable with the judges' boat, anchored 700 ft. farther out in the lake. Thus detailed information as to the ownership, history, record, and dimensions of the craft engaging in the carnival were given directly to the spectators, along with the announcement of the starts in the different events, the winners, etc.

During lulls between races, and there were many, the vast audience was entertained with music transmitted to them by the enunciators, and, still more interesting, during one of the night programs, Mayor Carter H. Harrison of Chicago, Bishop Samuel Fallows, and several other prominent speakers, aboard the yacht "Marigold," anchored 500 ft. from the stands, made addresses which were transmitted in the same manner.

In the hydroplane races "Baby Reliance II," the little 20-ft. boat owned

AQUATIC GRANDSTAND IN THE IN CHICAGO FOR REGATTA



by Commodore J. Stuart Blackton, of New York, showed herself to be the undisputed western champion, winning the beautiful \$5,000 Wrigley trophy, as well as several other cups and large cash prizes. Phenomenal bursts of speed were lacking, but "Baby Reliance II" showed her ability to keep going almost indefinitely at speeds of over 40 miles an hour, which is remarkable. James A. Pugh's 550-hp., 40-ft. "Disturber III" was a disappointment. Of the eight hydroplanes appearing for the meet, only

four were in commission at the end of the week. During the period of the regatta, three boats sank, and out of a total of 14 events, there were but three in which all the starters finished the entire race.

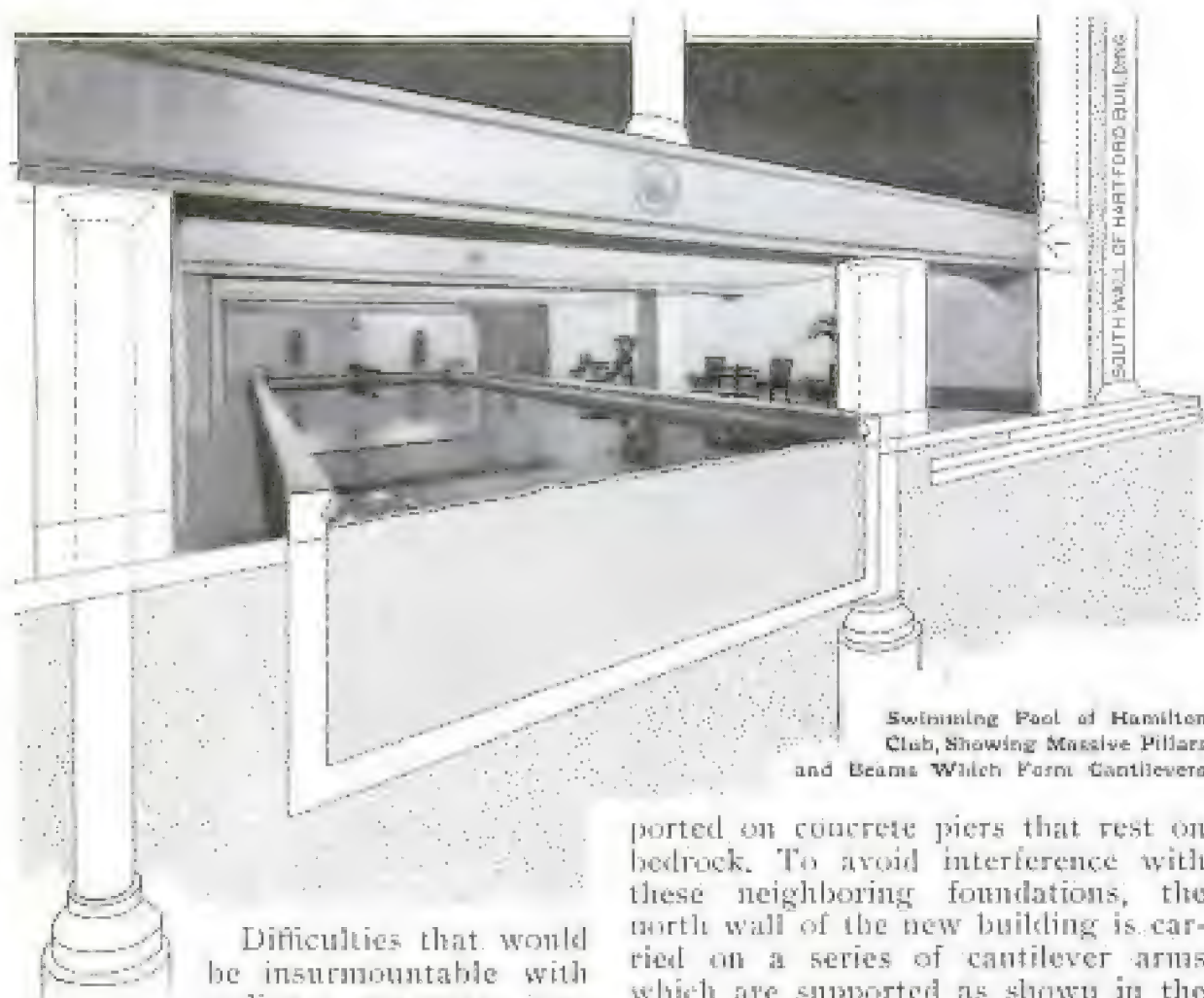
In the chief event of the sailing races, which was the international race between the "Patricia" of the Royal Canadian Yacht Club of Toronto, and the "Michicago," of the Chicago Yacht Club, the Canadians captured the championship of the lakes by winning three out of the four races.

INTERESTING FEATURES OF DEEPEST BORE HOLE

The sinking of the deepest bore hole in the world, located at Czuchow, Silesia, and reaching a depth of 7,350 ft., consumed a total of 813 working days and cost \$75,000, or over \$10 per foot. From 1,880 ft. downward the

boring was done with diamond drills, over 700 carats of diamonds being consumed. At a depth of 7,200 ft. the whole drilling outfit weighed over 15½ tons. The total weight of the metal tubes with which the bore hole is lined is no less than 280,000 lb. Near the bottom of the hole the temperature registered 182 deg. F.

CARRYING A SKYSCRAPER ON A CANTILEVER



Swimming Pool of Hamilton Club, Showing Massive Pillars and Beams Which Form Cantilevers

Difficulties that would be insurmountable with ordinary masonry construction are comparatively easy of solution when the modern steel skeleton is used, and the problem for the modern architect is not in the construction, but in expressing unusual structural features in such a way as not to offend the eye. A difficulty often met with in the erection of high buildings is the interference of the foundations of an existing building with those of a new building being erected on an adjoining site. A pronounced case of this kind occurred in connection with the recently completed building of the Hamilton Club in Chicago. The Hartford building, which occupies the adjacent lot on the north, is supported on grillages, or the so-called "floating" foundations once in common use. These foundations project about 10 ft. into the Hamilton Club lot. The new structure is sup-

ported on concrete piers that rest on bedrock. To avoid interference with these neighboring foundations, the north wall of the new building is carried on a series of cantilever arms which are supported as shown in the accompanying diagram.

Fifteen stories will ultimately be carried on this simple structure. For resisting the heavy stresses, the girders are necessarily of greater depth than the floor, and project below the basement ceiling. As will be seen from the accompanying view, the architect has seized on this as an opportunity for the development of a series of massive pillars and beams, thus giving appropriate and striking architectural expression to a structural necessity.

¶The French Antarctic expedition in the ship "Pourquoi Pas" is the first polar expedition that ever returned to civilization with its entire membership in perfect health, according to a report by Dr. Liouville, surgeon of the expedition.

COMMENT AND REVIEW

"S-O-S" Save Our Streets

THERE are so many new "reforms,"—about one a minute, like the boats at Detroit—that the average citizen dodges at the mere suggestion of another. But here is one that is practical, and should sound good to owners of property on paved streets. In most American cities the completion of a new pavement seems to be the psychological moment for some gas or electric company to discover that it needs new or additional mains, and up comes a long stretch of the new street. To be sure, the ditch is filled and the surface replaced in a more or less careless fashion, but we all know that that particular portion of the street is never the same again. Or it may be the property owner,—who usually lives on the opposite side of the street,—who wants connection, and so in goes another ditch, this time at right angles. The contractor makes a bluff at replacing the paving, but for years to come there remains a ridge or a hollow to mark the spot. For some reason everybody, including even the abutting property owner, seems to regard the street surface with utter indifference. Some pillage it like a Goth, while others consider the proposition with the hopeless despair of a polar bear in a cage.

Isn't it about time we learned something from the other side? For years the "highway" has been a thing sacred to the people. Even so long ago as the building of the first tramway in London, George Francis Train, an American, was put in jail for "tearing up the King's highway," because he had dug up a block or so beyond his permit. In many European cities the problem has been solved, and there seems no good reason why it cannot be solved here in the same way. No individual nor company is allowed to break the surface of a street or excavate the street. When either course is necessary, the city makes the opening and, after pipes or wires are laid, restores the paving in the best possible manner. And the city charges only actual cost, but collects enough to insure the best possible job that can be done. In this way the temptation to hurried, neglectful, indifferent work is avoided; the public are insured a minimum of annoyance while the work is being done and a maximum of excellence when completed.

What we need in many of our city administrations is some one big enough to send out the call for help and get the right answer; the "S-O-S" in this case meaning "Save Our Streets."



Passing of the Runaway Boy

FOR a boy to "run away" from his home fifty years ago was anything but an infrequent occurrence; in fact, it was looked upon often as an evidence of smartness in the youth. That he had a good home and kind parents did not seem to count for much. There were two bright, glittering goals which stood out against the sky, overtopping all the rest: One was to run away to sea; the other being to go west and fight Indians. The choice largely depended on the distance the young adventurer lived from the ocean. Today the young man seeks success in a very different way.

The passing of the sailing ship with its long voyages to far away and little known ports and peoples is largely responsible for this. Then the opportunities to win fame and fortune in more or less gallant deeds were not uncommon. Such vessels went armed, lending a charm for the

would-be sailor. There was, moreover, the opportunity of developing into both a good sailor and shrewd business man, for in those days the character and profit of the return cargo was left to the judgment of the captain. Now the captain of a merchant ship has as much to say about his cargo as the conductor of a freight train. Cable and wireless messages from the main office settle the buying and shipping. Return cargoes are bought and sold again before an outbound ship is half way to her destination. These conditions have reduced the chance for rapid promotion and easy fortunes to the working basis of any ordinary line of business on land. As for the young Indian fighters, they have disappeared with the redmen and the blood-and-thunder literature. The boy of today goes in for all forms of electrical work; he has wireless in the attic and his antennæ rise from housetop and barn; he builds steam engines, and does all kinds of work in wood and iron and brass; he is a more expert photographer at fifteen than the professional of a generation ago. Instead of the old yellow-back dime novel, he reads magazines and monthlies devoted to mechanics and other useful arts. He can tell you more details of the American Navy than his father ever knew.

The old days will never return. Now, if a boy desires the best marine training the world offers, he joins the American Navy, and he doesn't have to run away from anything to do it; in fact, he has to be a pretty fit subject to be accepted and secure the wonderful advantages of training and travel which our country provides its young men.



SO much progress has been made in the art of flying that the layman has been unprepared for the series of disheartening fatalities which for weeks past have been of almost daily occurrence. Already, the death roll for 1912 is not only large, but includes many airmen who were reputed to be experts. It is true, of course, that while the total is large, the percentage is rapidly decreasing, for at the opening of the season there were not less than 6,000 accredited airmen. Possibly some of these, made bold by past immunity from serious accident, relax their caution and pay the penalty.

**More
Caution in
Flying**

Yet in many cases carelessness is not given as the cause. The mysterious and ever-to-be-feared air pocket constantly lurks as an unseen foe. The navigator in water has something substantial to aid him in avoiding danger; shoals, reefs, currents, even the wind can be detected and judged by signs which are both visible and known. The uncharted ether, changing in density from moment to moment, affords no such reliable record, and its danger spots shift from hour to hour. Safety and danger zones change places without warning, nor can any effort of man insure the one or remove the other. It is a condition which everyone who mounts into the air must expect, even though he have no fear.

Aircraft have been greatly strengthened and given more and better power, but thus far no construction seems to be able to withstand the tremendous shock of a too-sudden and abrupt change in course. A steam locomotive turns turtle if hurled abruptly against a sufficient grade, even though the track lead in a perfectly straight line; and leaves the rails if driven at too high speed on to a sharp curve. Automatic safety devices have amounted to practically nothing in the aeroplane, and the truth is being brought home more forcibly each day that skill and experience are the safeguards on which the

airman must rely. For this reason learners should be impressed with caution as the first cardinal principle, and teachers should not pass even a ready student until he has thoroughly qualified under all conditions possible to compass during instruction. On the other hand, each accident should point out a warning of how not to do the thing which failed, and the hundreds of enthusiastic beginners will do well to study what to avoid. The fliers will increase in numbers, but they owe it to the art they espouse not to indulge in reckless freak performances. Amateurs may well heed and follow the example of that father of flight, the late Wilbur Wright, whose motto was "Slow but Sure."



THE transformation from the sail-propelled man-o'-war to the complicated mass of machinery known as the modern battleship is not one bit more pronounced than the improvement which has taken place in the personnel of the men who compose the human working parts of these great machines. Time was when the Navy was looked upon by many as a sort of reform school, a last resort to which young men could be sent who were not quite bad enough to put in jail and not good enough to roam at large. Such conditions have fortunately passed away and the American Navy today is composed of brains and muscle of the highest order

*High
Standard in
Our Navy*

and a personnel of which the country can well be proud. I was specially impressed with this fact when during the past season I spent some days in a well-known New England port which is seldom without one or more naval vessels during the summer. At this particular time there were four battleships and eight smaller fighting craft, with a total of over four thousand men on board. On two of the battleships the men had not set foot on land for six months—an unusually long time—and naturally were anxious to get ashore. When I saw the ships' steam launches towing the long lines of boats filled with a thousand men, with 24 hours' shore leave, "a hot time in the old town tonight" seemed to me inevitable. And there's where I guessed wrong. The young men were allowed the fullest liberty; they had plenty of money and were very live wires; and the saloons and places of amusement were making special efforts and working overtime to attract visitors.

When the 24 hours expired and the launches came puffing into dock again, I watched the boys load into their respective ships' boats, and out of one thousand, two, just two boys, required assistance from their comrades. And the chief of police told me his men had not had occasion to arrest a single man. To me the high standard of conduct, the respect for the uniform, and respect for one's self, which is taught these young men, was a most impressive thing. Can you imagine 1,000 young men of equal age, land-men, including clerks in banks, offices and stores, and skilled young men in all the various mechanical trades, going out on their first holiday in six months, with plenty of money to spend, and all restraint removed, and coming back at the end of 24 hours with only two men "disabled"?

The conduct of the boys of the Navy, ashore in their own land, with less necessity for constraint than in a foreign port, deserves the highest commendation, and better words of praise and congratulation than these few lines express.

H. H. WINDSOR

MARSH BECOMES PEPPERMINT AND BEET FARM

The story of Prairie Farm, located between the Flint and Shiawassee Rivers, near Saginaw, Mich., is of exceptional interest as showing what can be done by the employment of modern methods

three 250-hp. boilers, two 24-in. and four 12-in. centrifugal pumps, is located at the west side of the farm, at the middle dike, making it possible to pump out both sides in case of rains or floods; and a railroad has been built into the center of the farm to care for the numerous products.

As it now stands, it is a scientifically managed farm of the best modern type, with 4,000 acres actually under cultivation, to which it is planned to add 400 acres each year. There are 1,250 acres of peppermint, this crop being exploited in two distilleries for the manufacture of peppermint oil. Among the other crops sugar beets



Digging Ditches and Building Dikes through the Great Marsh in Order to Obtain Drainage

of reclamation, hand in hand with scientific management, to create a valuable property out of almost worthless land.

When, some nine years ago, this vast farm of 9,500 acres came into the possession of the present owners, it was practically all marsh and was largely covered by water. Immediately engineers prepared plans for the draining of the land and for its protection from floods. Three dredges were built, and 25 miles of dikes constructed, including a cross dike through the middle of the farm to protect the lower half. Ditches, 50 ft. wide, were excavated on each side of the dikes, and at the present time the works of reclamation and protection are completed.

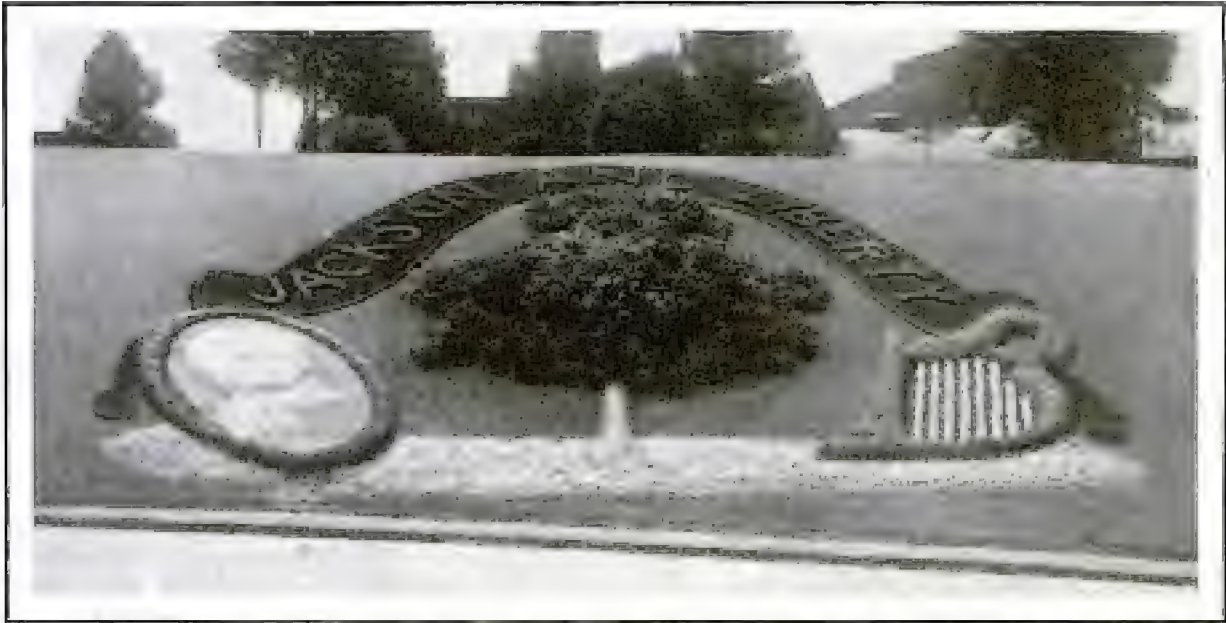
A pumping station, equipped with

is the next in importance, but ample acreage is also given to the more ordinary farm products.

A small town with some 60 tenement houses for the farm

Beets Thrive on Hundreds of Acres of the Reclaimed Marsh





Floral Design in Baltimore, with Hickory Log and Hickory Cuttings Forming the Hickory Tree of the Democratic Emblem of 1828

help, of whom there are some 100 to 200, according to the season, and two large apartment or boarding houses has been built up, and the whole undertaking is proving most successful.

LEAD BEER-STEIN COVERS WORRY GERMANS

The question of how much lead may enter into the composition of covers for beer steins without endangering the health of beer drinkers has been a burning one in Germany lately. Some years ago a law was enacted making 10 per cent lead the maximum admixture, the remainder to be pure tin. This did not satisfy the manufacturers, who claimed that even a much higher percentage could not possibly be injurious. To throw light on this important question investigations have been carried on at the pharmacological institute of the Berlin University by Prof. A. Heffter and Dr. F. Sachs, and the results were recently published in the *Quarterly Journal of Medical Jurisprudence and Hygiene*. The conclusions of the learned investigators were to the effect that, so far as lead poisoning is concerned, the most capacious beer drinker has little or nothing to fear, and the beer-stein makers can now put 35 per cent lead in the covers.

POLITICAL EMBLEM IN FLORAL DESIGN

A unique floral design adorns the slope of the Mt. Royal Station of the B. & O. Railroad at Baltimore. This design is that of "Jackson and Liberty" such as was at the top of the Democratic voting ticket many years ago. The design was made by the public park commission of Baltimore and was inspired by the democratic national convention which was held in that city last June.

The design, which is 66 ft. in length and 54 ft. in width, contains 7,000 rhododendrons. The center of the design is a hickory tree, the trunk of which is a real hickory log, while the branches and leaves are hickory cuttings. In the lower left-hand corner an oil-painted picture of Jackson occupies a space of 18 by 10 ft. The design attracts a large number of visitors daily, and will remain on display until cold weather commences.

WATERPROOF SHOES

A shoe manufacturer in this country is putting a waterproof shoe on the market which is said to be radically different from other makes in that a new method of attaching upper and

sole has been adopted. In this method the upper is turned over and sandwiched in between a thick inner sole, the under edge of which is channeled, the welt being held in place by staples, the points of which are bent over to prevent pulling out. The sole is then sewed to the welt.

The general practice in shoe manufacture is to sew the uppers to a thin strip of leather, called the welt, and then sew or nail the sole to this welt.

PHONOGRAPH MESSAGES FROM AEROPLANES

A novel and in many ways a most interesting effort to communicate information from a military aeroplane to officers on the ground has met with marked success in the course of recent experiments in France. The new scheme involves the use of specially built phonographs, one on the machine and one at each headquarters which it may be desirable to have receive the messages. Then in the course of the aerial scouting trip, the observer, or even the pilot himself, dictates into the machine such information as may be considered interesting or valuable. Disk records, of a material soft enough to receive the impression of the recording stylus, but less breakable than ordinary wax records, are used, and by the expedient of having a special feed on the traverse screw of the graphophone, it is not



French Military Airmen in an Aeroplane Dictating Information

into a Phonograph and Dropping a Record

suggested. These, while they would land the records lightly from great heights, are open to the objection that they might let the messages drift into hostile hands.

STANDPIPE GASOLINE GAUGE

An ingenious gasoline gauge is being placed on the market by an American automobile-accessory concern. It comprises a cylindrical standpipe which is inserted into the gasoline tank of the automobile and soldered in place, and which contains a center staff revolved by a sliding float. The revolutions are controlled by an arm which engages a spiral slot, running from top to bottom of the standpipe, at the upper end of which is a circular dial.

A hand, mounted on the upper projecting end of the center staff, registers the height of the float on the circular dial, the slot being so cut that the hand has a sweep of 180 degrees. A glance at the dial, therefore, is all that is necessary to show how much gasoline there is in the tank.



Officers Listening to a Record

Dropped from an Aeroplane in the tank.

NEW RACING CAR WITH FRONT DRIVE

A unique car for racing is being built by George DeWitt. The "Gila Monster," as he calls it,—and the name is not inappropriate—is one of the most novel machines that has been brought before the American public in recent years. It is front-drive, front-steer, weighs 600 lb., and is intended to develop, when further adjustments have been made, a speed of close to 90 miles an hour. In the tests through which it was put shortly after its completion

The "Gila Monster" is a miniature automobile. It is equipped with a four-cylinder 35-hp. engine; multiple-disk clutch; selective transmission, and a set of very effective brakes. The balance is like that of a monoplane. The gasoline tank is under a long cigar-shaped hood over the engine. When in operation the rear wheels scarcely touch the ground.

One point in which the "Gila Monster" differs radically from the stand-

The "Gila Monster," Built for Racing with Minimum of Weight on the Rear Wheels



The Lower View Shows Front Axle and Details of the Driving Mechanism



the little car had no difficulty in making 60 miles an hour.

Front driving has long been a pet theory of racing men. They hold almost unanimously that the ideal car is one which is built on the same principle as the spear: all the weight in front. It is their contention that a car which applies all its power at the rear of a bulky body is always in danger at a curve: The rear wheels, with the traction and the power, tend to fly off the curve at a tangent. They are pulled out of their course by the steering gear, and a skid or a spill is the logical result.

and motor car is the elimination of the differential. Speaking of this, De Witt points out that no manufacturer has ever found it necessary to incorporate a compensating device in the front axle, and with the front-drive car the traction of the rear wheels is so slight that there will be little road friction when rounding a curve. He asserts that the weight caused by the addition of a differential would cause more tire wear than would friction in its absence.

The brake drum is set in a place that would seem peculiar on a car of another sort. It is fixed in the front

axle about 6 in. from the drive shaft. Two sets of universal joints in the front axle insure the flexibility made doubly necessary by the absence of the differential.

Weight has been cut wherever possible. The framework is of hickory, reinforced with steel. Even the brake and clutch pedals have been put through the weight-reducing process until they resemble sieves. The drill has been called into requisition upon every ounce of superfluous metal.

SHELLING ICEBERGS IS UNPROFITABLE

The scheme suggested following the loss of the White Star liner "Titanic" that icebergs might be destroyed by shells from the guns of naval vessels has been tried and found impracticable, as was predicted in these pages. Experiments made early by the United States scout cruiser "Birmingham" demonstrated that there is no hope of eliminating icebergs as menaces to navigation by such means.

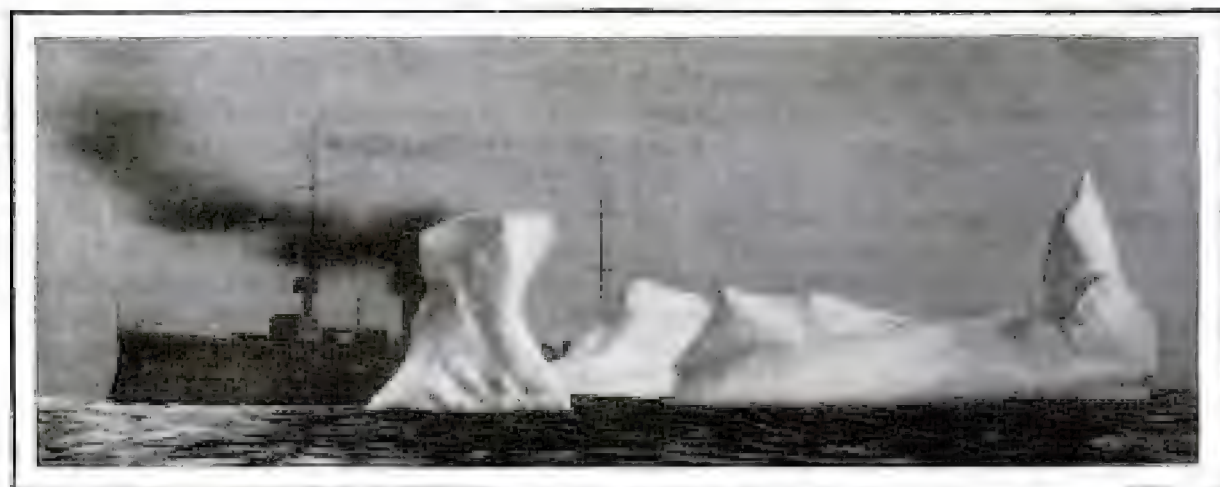
The "Birmingham" spent most of one day in July in firing shells from her 5-in. guns at the huge berg shown in the accompanying photograph. At the conclusion of the firing, little damage had been done to the berg, except to break off chips and smash projecting points into splinters. The shells failed to penetrate the ice to any considerable distance, nor did they

produce any great cracks or rents. They simply raised showers of splinters, and that was all.

The naval officers had little expectation that the results of the experiment would be different from what actually occurred. The impenetrability of water, both in liquid and solid form, was too well known to them to admit of much faith in the scheme. The idea was one of a myriad suggested in all seriousness after the sinking of the "Titanic." Furthermore, as naval officers pointed out, so great a portion of an iceberg is submerged, that to blow off the top of one by gunfire would simply result in raising above the water part of the submerged portion of the berg, so that the smashing process, even if effective, would have to be continued almost indefinitely.

The "Birmingham" made these experiments just before being recalled from her patrol of the navigation routes, which was begun last May for the purpose of giving wireless warnings to navigation of ice in the paths of the liners. The patrol was abandoned because of the decrease in the amount of ice in the navigation routes, owing to continued warm weather.

At least a part of the French prize for "aviettes" was won in Paris, July 4, by one rider who succeeded in making his man-power machine cover distances of 11.7 ft. and 10.8 ft. respectively with and against the wind.

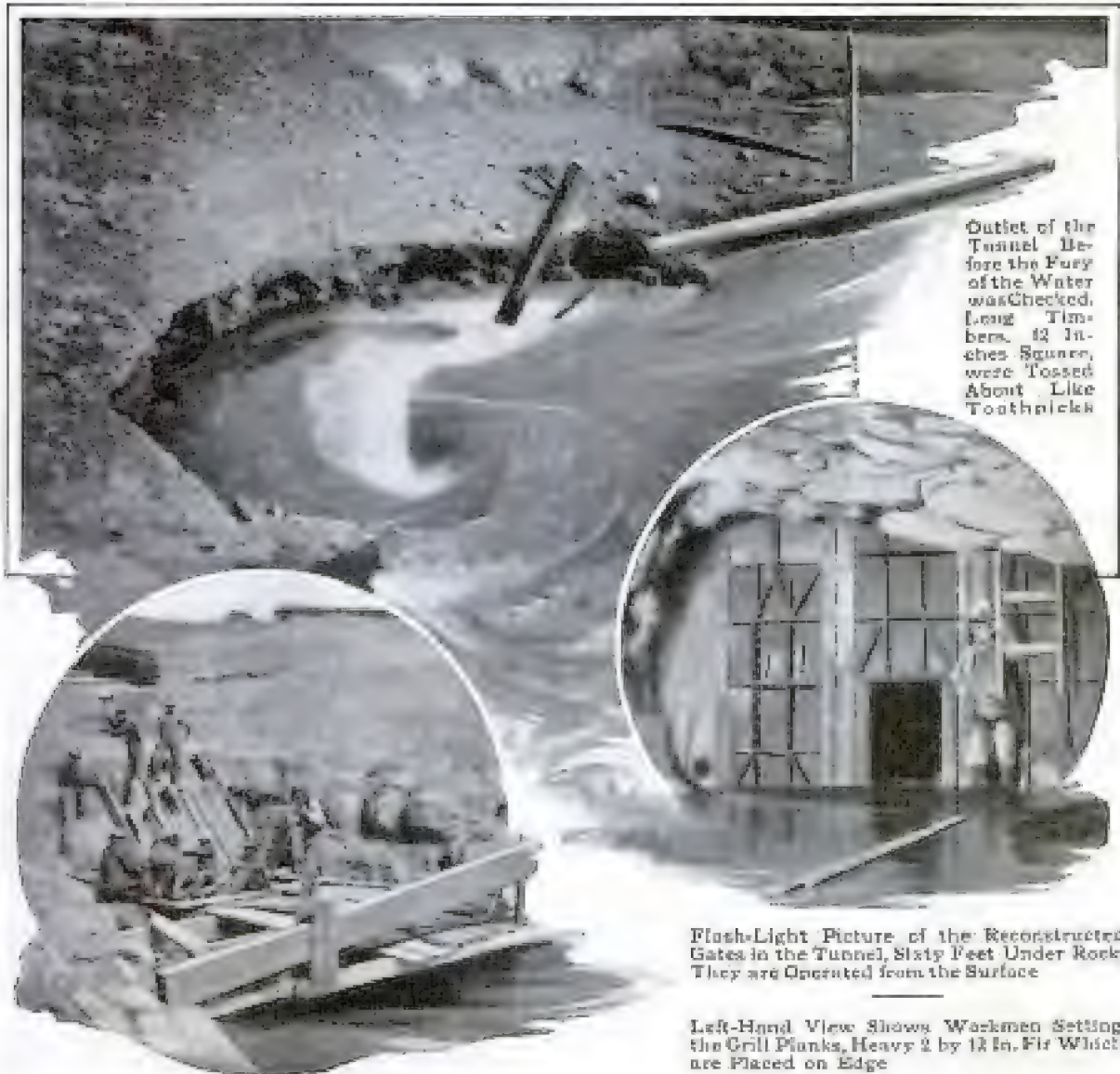


Scout Cruiser "Birmingham" near Icebergs Which were Shelled without Material Shattering

THE HURRY CALL, "GATES GONE OUT!"

A hurry call came into Salt Lake City. "Tunnel gates gone out. Send help at once." Forty minutes later two engineers were on a Rio Grande engine bound for the Sevier River, for it was that river which was out of

The reservoir outlet is a tunnel through solid rock adjoining the dam. It is 400 ft. long, 14 ft. wide and 10 ft. high. In the center of it are the controlling gates, mechanically operated from the surface, 60 ft. above; and



Outlet of the Tunnel Before the Fury of the Water was Checked. Long Timbers, 12 Inches Square, were Tossed About Like Toothpicks

Flash-Light Picture of the Reconstructed Gates in the Tunnel, Sixty Feet Under Rock. They are Operated from the Surface

Left-Hand View Shows Workmen Setting the Grill Planks, Heavy 2 by 12 In. Fir Which are Placed on Edge

control, and threatening ruin to the great Pahvant Valley.

The river had been dammed for irrigation purposes. The reservoir dam is of fair size, even in the heart of great water projects, for it is 900 ft. long and 66 ft. high. The reservoir has a storage capacity of 3,000 acres of water, 30 ft. deep; sufficient to irrigate 75,000 acres of arid land,

the destruction of these gates by the enormously swollen flood in the spring paralyzed all control of the water, threatening the waste of every gallon, and the loss of all crops for that season on the immense irrigated tract. Hence, the urgent call for help.

Before the engineers arrived, over 400 wool and grain sacks were filled with earth and dumped into the tun-

nel inlet; but although some of the sacks weighed half a ton, they were instantly swept down through the tunnel. Great timbers, 12 in. square, were placed in a slanting position from the irregular edge of the tunnel opening, but broke like pipestems.

Within 30 minutes after the engineers sprang from their train, a telegram was in Salt Lake City calling for a car of cement by special train; and a crew of men were hewing pockets in the rock walls of the tunnel entrance, to take the ends of the great concrete beam which the engineers had almost instantly decided upon. This beam was to be 22 ft. long and in cross section 3 ft. 6 in. each way, with a 60-deg. slope on its outer face. Its position was to be just at the then level of the water, and timber forms for it were made ready to be slung across, the moment the side pockets were hewn out, and the cement arrived.

The great concrete beam was cast as quickly as brawny arms could throw the bags of cement from the car, and mix the concrete. After it was cast, the party had to sit by and watch the rush of water through the tunnel for three days while the beam hardened.

Then they put in the "grill." It was of 2 by 12-in. fir, set edge-wise against the sloping face of the beam, so that only the 2-in. edge was exposed to the pressure. The lower ends lodged against the rocky bed of the reservoir; the upper ends against the concrete beam. This reduced the leakage so that men, who cared nothing for working in water up to their hips, could commence on the reconstruction of the new and stronger tunnel gates. Before the permanent gates were installed the reservoir was full, an overflow running through the waste sluice. The 75,000 acres of unparalleled fertile land was saved.

SEATS THAT BECOME LIFE RAFTS

Buoyant deck seats which are easily convertible into rafts of a sea-

These convertible seats are made by an English firm. To quickly convert the seat into a raft the person sitting upon it has but to raise the front portion until it is level with the bottom of the seat. At this point it automatically locks itself and is ready to be floated either side up. Each seat is fastened to the deck by hooks and light lashings. The hooks are loosened and the lashings undone by the raising of the front of the seat.

Each of the benches is 9 ft. long and is supported on four separate metal air tanks. When it is converted into a raft it is capable of bearing the weight of half a dozen people. Should no



Seats Convertible into Rafts. Each Having Room for Carrying Six People Safely

worthy character are being installed on a transatlantic line of steamers.

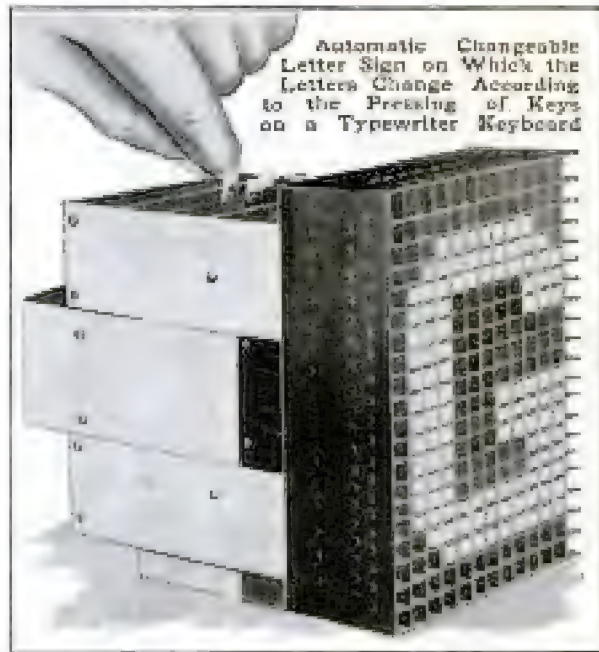
raft it is capable of bearing the weight of half a dozen people. Should no

one happen to be using the seat when the boat sinks, the rising water on the deck would lift it, unfasten the hooks and lashings, and let it float off free so that any swimmer might make use of it. The picture shows a consignment of the seats being tested at the factory preparatory to being shipped to the steamship company.

TYPEWRITER KEYBOARD OPERATES SIGN

A new idea in changeable letter signs, with uses varying from kindergarten lessons to big advertising signs, is just going on the market. An oblong metal sheet is pierced with slits at regular intervals, and in each slit a curved strip of thin steel is fixed so it will slide out on either side of the sheet. By sliding out these little strips on the face side, any letter can be formed. The sliding out of the strips is easily performed with a small magnet, this feature making the apparatus an interesting device for kindergarten work.

For commercial use, such as for advertising signs, or for use as a railroad-station signboard or a carriage call board, an apparatus has been devised



for the rapid formation of letters automatically, the letters appearing on the signs in accordance with the tapping of keys on a typewriter keyboard. Striking a letter key on the keyboard perforates a strip of paper with certain slits, somewhat after the manner of a piano-player roll, and the strip of paper then passes along to a contactor, an instrument which allows electrical impulses to pass through the perforated places, and thus set up a magnetic action which causes the proper strips to slide out on the face of the sign, forming the desired letters.

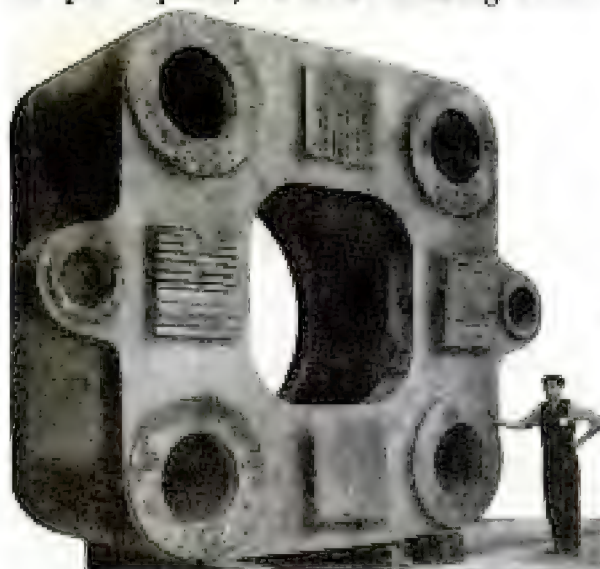
GIGANTIC HIGH-SPEED FORGING PRESS

An immense casting has been made at South Bethlehem, Pa., to be used as a cap for a 10,000-ton high-speed forging press. Although nominally of only 10,000 tons' capacity, this press is estimated to be of sufficient strength to receive strains up to 20,000 tons. The development of this press has taken the greater part of a year. The speed demanded was enormous for such a mass, and an idea of the conditions to be met in its construction may be conceived from the fact that it involved the designing and making of a valve, no less than 18 in. in diameter, and capable



Forming the Letter H on the New Changeable Letter Device by Drawing Out Steel Strips with a Magnet through Slits to the Face of the Sign

of withstanding a pressure of 12,000 lb. per sq. in., without leaking more



Casting for Cap of 10,000-Ton Forging Press Powerful Enough to Lift an Ocean Liner

than a drop a second; which means practically a perfect valve. The speed requirements were such that in an hour the press will produce 60 car wheels. Even greater efficiency is expected,

however, after the double crew, that will operate the press, has been trained in its handling. In spite of its gigantic mass, the controlling mechanism of the machine is so delicate, that a small boy on the pulpit can manipulate it by means of the operating valves, exerting sufficient strength to lift an ocean liner if it could be properly balanced.

The casting for the press shown in the accompanying illustration is only one of the many castings and forgings requiring for their transportation a special car, built for the purpose. The columns of this press are 30 in. in diameter and hollow-forged of fluid-compressed steel, while those of similar presses, previously ranking as the largest of their kind, were 28 in. and 26 in., respectively. The cylinder is 72 in. in diameter and said to be the largest copper-lined cylinder in the world. The two former presses referred to are of greater capacity, but the parts are not of such enormous size.

STORING SPARE WHEELS ON RACING AUTOMOBILES

The storage of extra wheels, a problem even on the ordinary touring car, is, of course, still more difficult

The Spare-Wheel Storage Place on a Gregoire Racing Auto



minimum. During the recent "Grand Prix" of the French Automobile Club several new ideas in storage places drew attention, two of which are shown in the accompanying illustrations.

A Lion-Peugeot Racing Automobile, Showing Storage Place for Spare Wheel



of solution when the automobile in question is a racing car, for the storage must be so arranged as to keep the wind resistance at a

HOSPITAL PATIENTS GO ON STRIKE

A dispute between a number of patients in the tuberculosis sanatorium at Beelitz, Germany, was the cause of a strike by a majority of the inmates who refused to take medicines or food until certain restrictions imposed by the director had been removed. The ringleaders of the protest marched about the grounds and endeavored to gain "sympathetic" support from the patients in all the other wards. Action first was taken by men patients, but later they were joined by the women who also refused both medicines and food. The "strike" lasted about 10 hours, after which some modification of certain new rules induced the strikers to resume their normal routine. So far as known, this is the first case of a strike in a hospital, but similar disturbances have taken place in jails.

"FREAK" KNOT SUGGESTIVE OF ANIMAL

While a street in Seattle, Wash., was being cleared, a maple tree was found bearing the curious knot shown in the accompanying illustration. The only man-made addition to the "freak" is the eyes, which rendered nature's



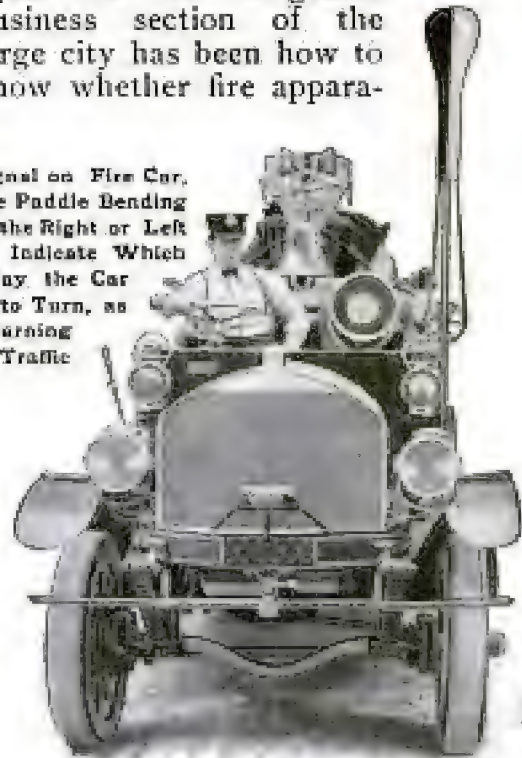
"Freak" Maple Knot Gives Appearance of Animal Biting a Bone

work so complete as to make the whole suggestive of a ferocious animal chewing a bone.

FIRE APPARATUS CARRIES WARNING TO TRAFFIC

Ever since the adoption of the silent fire-alarm system, the problem that has confronted the members of the traffic squad in the congested business section of the large city has been how to know whether fire appa-

Signal on Fire Car, the Paddle Bending to the Right or Left to Indicate Which Way the Car Is to Turn, as Warning to Traffic



tus responding to a call will go straight ahead or will turn into any particular street. Under the circumstances every traffic man not only has to clear a right of way along the street the fire apparatus is coming, but also has to prepare the way up and down the intersecting street in anticipation of a turnout, even though the latter may not be needed.

With the introduction of the high-powered automobile service in Baltimore, with its great increase of speed over the horse-drawn vehicles, one of the members of the fire department invented the signal apparatus which is shown on this page. This signal is a simple affair, consisting of a large red-and-white-colored paddle, and is operated with a wheel and chain gear by the man who rides beside the driver and who also has charge of ringing the warning gong.

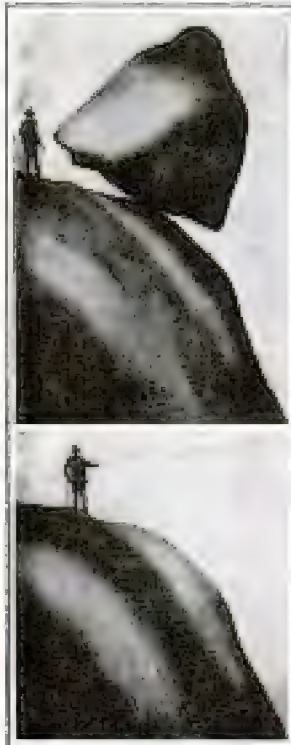
If the machine is going straight

ahead, the paddle is maintained upright, as shown in the picture. If it is proposed to turn out at a certain street intersection, the paddle is dropped to the left or right, as the case may be, just as soon as the machine reaches the other end of that particular block. As the paddle is high and can be seen two

or three blocks away, the traffic policeman has ample opportunity to clear the way. The signal apparatus has been in use in Baltimore some months and while it is the only system of its kind, it has already proven its value and will be attached to all the fire-department apparatus.

FAMOUS BALANCED ROCK TUMBLES

The famous balanced rock which has been one of the natural curiosities of the province of Buenos Aires, Argentina, since



time immemorial, lost its balance the early part of this year, rolled down the steep incline of the mountain, and was crushed at its base.

The rock measured 16 ft. in diameter and was about 13 ft. high, weighing about 300 tons. It was so nicely balanced that it swayed in the wind. Its loss of equilibrium is variously ascribed to natural causes and to

the tourists' custom of throwing empty bottles between the rock and its supporting cliff, to see them crushed by the rock's swaying. This bottle-crushing procedure is claimed to have caused abrasion of both the rock and cliff.

CDrs. W. and J. Meyer, who invented the apparatus for readily performing operations on the chest, described in a recent issue of this magazine, have dedicated their patent to the use of the general public.

WATCH FOR FOREST FIRES FROM TOWER

The cities and towns of Reading, Wakefield, Melrose, Stoneham, and Saugus, along with other communities of Massachusetts, within a 15-mile radius of Bear Hill, are to be protected from danger of forest fires by the erection of a fire watch tower upon this hill. The tower, which will be of steel, and will rise to a height of about 50 ft. above the crest of the hill, will be connected with the fire stations by telephone. The watchmen stationed in the tower will be provided with powerful field glasses.

NEW TYPE OF MACHINE TO TEAR UP OLD ROAD

Road-making machines, called scarifiers, which will first tear up the old stone beds of roads, are being developed in various types, many of them being simply attachments to



Novel Type of Machine Attached to Road Roller, to Tear Up Old Roadbed Preliminary to Resurfacing

road rollers. The accompanying illustration shows one which is operated as a side car to a road roller.



The "Flying-Boat" sailing above Lake Keuka, Hammondsport, N. Y.

NEWEST HYDRO-AEROPLANE IS A FLYING-BOAT

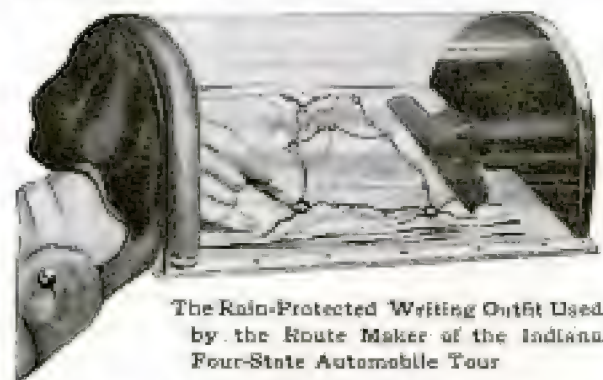
The latest Curtiss hydro-aeroplane, shown flying above Lake Keuka at Hammondsport, N. Y., deserves the title of "flying-boat" more than any type of aerial machine. Instead of being supplied with the ordinary pontoon, this machine is practically a speed motorboat provided with planes. The boat, which has a spray hood to protect pilot and passengers from water, and in which the engine itself is located, is attached directly to the lower plane instead of hanging some distance beneath it, as in the ordinary hydro-aeroplane. There is no front elevating plane, and the rudder and rear elevating planes are parts of the stern of the boat.

The boat is 26 ft. long, and has a width of 3 ft. with a depth of hull amidship about equal to the width. The planes are $5\frac{1}{2}$ ft. deep and about 30 ft. wide. The pilot and passengers sit well down in the hull. The boat itself is so strongly built that it can be beached with safety even through a

surf, and is capable of being handled as a fisherman handles his dory, or anchored to a buoy like a yacht.

WATERPROOF WRITING CASE OF A PATHFINDER

The official pathfinder for the 1,225-mile four-state tour of the Indiana Automobile Association used a special waterproof writing contrivance in



The Rain-Protected Writing Outfit Used by the Route Maker of the Indiana Four-State Automobile Tour

making his notations and compiling the route. This consists of a steel writing file with spring clip, covered

with celluloid. One end is of sheet metal and the other end, through which the hand and wrist is thrust to write, has an adjustable waterproof curtain.

With almost continuous rains during his trip, the route maker was able at all times to keep the manuscript dry and preserve the route.

MOLD FOR CONCRETE PILES CAN BE UNROLLED

At the Pearl Harbor naval base in Hawaii the government is putting in place a number of concrete piles which are molded quickly and cheaply in a rather unusual manner in an eight-sided mold so hinged as to unroll after each pile is cast. The piles are said to be exceptionally strong.

The reinforcement of the pile consists of longitudinal rods and any desired number of wire hoops through which the longitudinal rods are run. The pile is an eight-sided affair and there are, of course, eight rods running the full length, and one in the center which is sometimes hollow for jetting purposes. Besides the center loop the hoops have eight peripheral loops, all made by winding wire around a pegged table top. After the rods are run through the loops on the wire hoops, the entire reinforcement is carried to the mold and laid in place.

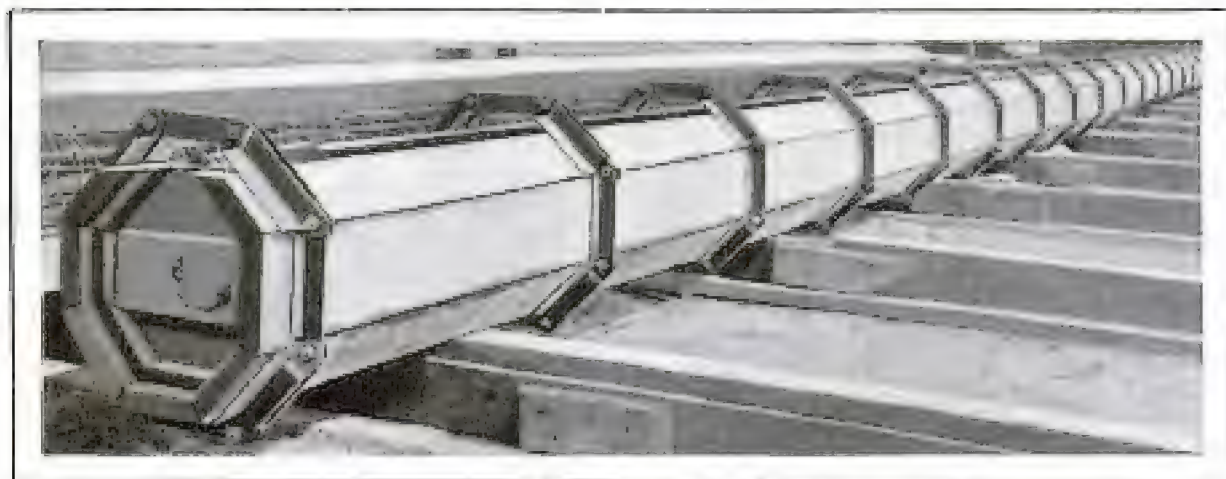
At that time the eight sides of the mold are extended and lie flat on the skids. When the reinforcement is

ready, seven of these sides are brought into place, the ends inserted, and the reinforcement centered by hanging it with wires. The relative position of the sides of the mold is always the same, as they are bound together by eight links of an endless chain. The eighth side of the mold is left off for pouring purposes.

When the pouring is completed the top side of the concrete is straight-edged. The pile is allowed to set for 24 to 48 hours and then the mold and all is rolled over until the exposed side of the pile is the base and rests on the skids. The bolts in the link, now on the bottom, are removed, and the whole mold is flattened out and taken away to be used for another pile.

After curing on the skids for 30 days these piles will withstand the roughest kind of treatment, it is said, and have records of being driven through boulders without splitting at the end. The molds, which are generally made of wood, deteriorate very slowly and if the inside surface is oiled before use, they require practically no repairs and will last almost indefinitely.

While the American ocean resorts may boast of big business during the heated term, they still have much further to go before they will equal in popularity the holy city of Allahabad, India, where in one week more than 2,000,000 people bathed in the waters of the Ganges and Jumna which meet at that place.



Concrete-Pile Mold of Eight Sides So Hinged That It can be Unrolled after Use



Photos Copyright, 1912, by M. M. Webb.

Main Console and Great Organ at Zion City Tabernacle

Echo Organ at Zion City Tabernacle Prayer Room

ORGAN PLAYS IN THREE PLACES AT ONCE

An American firm of organ builders has recently completed, in Zion City, Ill., a pipe organ which is even larger than the famous one in the Salt Lake City tabernacle, and which possesses many new features in its construction. This giant musical instrument is really three distinct organs controlled, if desired, from the main console or keyboard. Two hundred feet from the choir organ, in the gallery at the entrance, is an echo organ operated from the main keyboard during processions. The second echo organ, in the prayer room at the other end of the tabernacle, can be played independently of the great organ or by the organist at the main console. The

organist can also sit at the prayer-room organ and operate the main organ.

The main console possesses many unusual features. It is mounted to revolve so that the organist may face in any direction. The organist's work is further simplified by the adjustable visible combination tablets on the console. These enable him to produce an effect quickly without having to pull a dozen or more stops. Another new feature is the coupling of the entire pedal organ with the great organ.

A wonderful echo effect has been produced by the location of the "vox humana" in the prayer-room echo organ. When this repeats the melody on

the "vox humana" of the great organ there is a startling resemblance to a singer's voice, softened by distance. Still another innovation is the set of chimes built into the gallery echo organ, which are used as responses to the melodies of the great organ 200 ft. away.

Some idea of the size of the giant organ may be obtained from these figures: There are 5,055 speaking pipes; the largest is 22 ft. long and the smallest measures but five-eighths of an inch. The instrument contains 1,500 more pipes than the famous organ at

Salt Lake City. The main console has four manuals, 70 stops, 52 couplers, 54 combination pistons, nine combination pedals, five swell pedals and one crescendo. And in addition to this the prayer-room echo organ has a keyboard of its own.

Electricity is, of course, the motive power. More than 1,300 miles of wire have been used in the cables and on the magnets. It requires a 10-hp. blower, forcing air through an 18-in. pipe, to keep the bellows of the organ filled. The organ is 40 ft. wide across the front, 20 ft. deep, and 30 ft. high.

MOTOR CAR WHICH CAN RUN UNDER WATER

An English automobile manufacturer who caters especially to colonial trade, has taken into consideration the danger of floods in the operation of



Motor Car Running under Water, the Smoke from the Exhaust Proving the Engine to be Operating

motor cars and in order to meet such unusual conditions, he builds his cars with watertight magnetos and carburetors. Before sending out cars he tests them under water, as shown in the accompanying illustration. The vertical pipe at the rear of the car shows that the engine was running during submergence, while the pipe projecting upward from the radiator, it is assumed, supplies air to the carburetor.

WEEKLY FLYING IN EUROPE TOTALS 80,000 MILES

Flight progress in certain European countries has gone so far that it is fast developing from the sensational into the commonplace. In the place of the occasional exhibition flights that the newspaper men once were quick to cable columns about to the ends of the earth; the most astounding cross-country journeys are now become humdrum, being disregarded altogether by the representatives of the daily press, and minimized to the briefest items even in the aviation magazines. For example, a perusal of a few issues of the foreign aviation weeklies reveals column after column of paragraphic comment, which five years ago could

have been created only by the imagination of a Jules Verne, or discovered in a copy of a newspaper from Mars. "On the 24th ult., Lieut. Pierra on a Farman biplane left Rheims, and later arrived at Dunquerque, having flown 220 miles, with two landings en route"; "On Monday, Comte d'Hespele left Brussels and reached Ostend in 54 minutes, a distance of 77 miles, accomplished at 91 miles per hour," etc.; to a total that is now estimated to exceed 80,000 miles a week. Moreover, the fatalities now attending this flying hardly exceed one death for each 100,000 miles against one for each 1,000 miles only three years ago.

ELECTRIC AID IN CLIMBING BRIDGE APPROACHES

A novel scheme was recently exhibited at Cologne, Germany, in a competition of plans for a new bridge. It was felt desirable to construct a high-level bridge that would allow uninterrupted traffic both on land and river. One of the plans entered was for a high-level bridge having slopes as steep as 1 in 12, which would be impossible for traffic under ordinary conditions. The designer of this

bridge, however, plans to equip the approaches with electrically driven chains, to which automobiles and horse-drawn vehicles may be at-



Suggested High-Level Bridge Provided with Electrically Operated Chains for Assisting Vehicles Up and Down the Steep Approaches. A Unique Plan for Crossing a River without Interfering with Land or Water Traffic

tached for haulage up the approaches and "easage" down the approaches. Little cars drawn by these chains are also provided for pedestrians.

NOISELESS GUN FOR KILLING HORSES

A curious horse-killing gun used in England to kill horses which have been injured, is now being adopted by American anti-cruelty societies be-



A Horse-Killing Gun, Discharged by Striking a Slight Blow with a Mallet, Which Kills Instantly and Noiselessly

cause of its noiselessness and surety of action. By a slight blow given in the manner shown in the illustration a bullet is noiselessly driven into the brain of the animal, killing it instantly, without a sound to attract attention in a city street.

GRADING HEADLIGHTS BY PHOTOGRAPHY

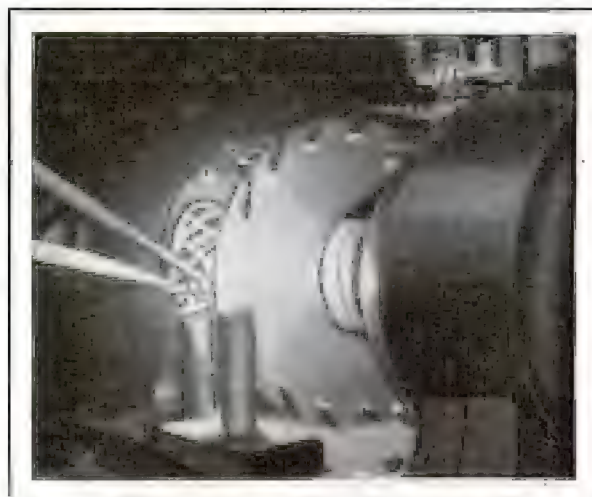
The camera as an aid in choosing fittings for motor cars has been called into successful use at an auto plant at Buffalo. It was necessary to make a choice between several kinds of headlamps, and road tests at night were not considered infallible in result, because of the possibility of differing weather conditions. So the camera was called upon.

On the night of the camera test a large screen was placed against a blank wall and the car from which the test was made was stationed some little dis-

tance away, facing the screen. The camera was placed in a fixed position. As each set of headlights was fixed to the supports on the car and the lights switched on, two photographs were made: One of the screen alone, to show the projection of the lamps' rays, and the other of the ground between the lamp and the screen, to illustrate the diffusion. All the exposures were made under exactly the same conditions, the plates were all well developed together and the prints made together. In this manner the photographic prints gave an accurate idea of the comparative lighting power of the various lamps tried out.

SHADOW ILLUSION OF A WIRELESS APPARATUS

Although moving at the rate of 1,800 revolutions a minute, the studs on the outer edge of a disk in a wireless-telegraph apparatus cast steady shadows that seem to be standing still, and that show clear and distinct in a time-exposure photograph, as was the original of the accompanying illustration, taken in the wireless station on the roof of a Philadelphia store. The apparent conflict with natural laws is, of course, due to the fact that the spark which casts the shadows is not continuous, but only flashes as each one of these studs passes a certain fixed point. Thus the shadows of the studs appear



Illusion of Steady Shadows Cast by Studs on a Disk Revolving at the Rate of 1,800 Times a Minute, the Photograph Being a Time Exposure

always in the same place, and cannot appear elsewhere. As a matter of fact, each of the shadows shown in this time-exposure picture and each of the studs shown, are not really separate studs with their shadows, but each is a composite photograph of all the studs and their shadows which in turn appeared at that point during the exceedingly small fraction of a second that the spark flashed.

THE ANTIQUITY OF MAN IN PERU

The Yale Peruvian expedition, organized under the auspices of Yale University and the National Geographic Society, sailed recently for Peru to continue the work of the expedition of

1911, in which Professor Hiram Bingham, head of both expeditions, discovered the remains of men believed by him and other authorities to be between 22,000 and 50,000 years old.

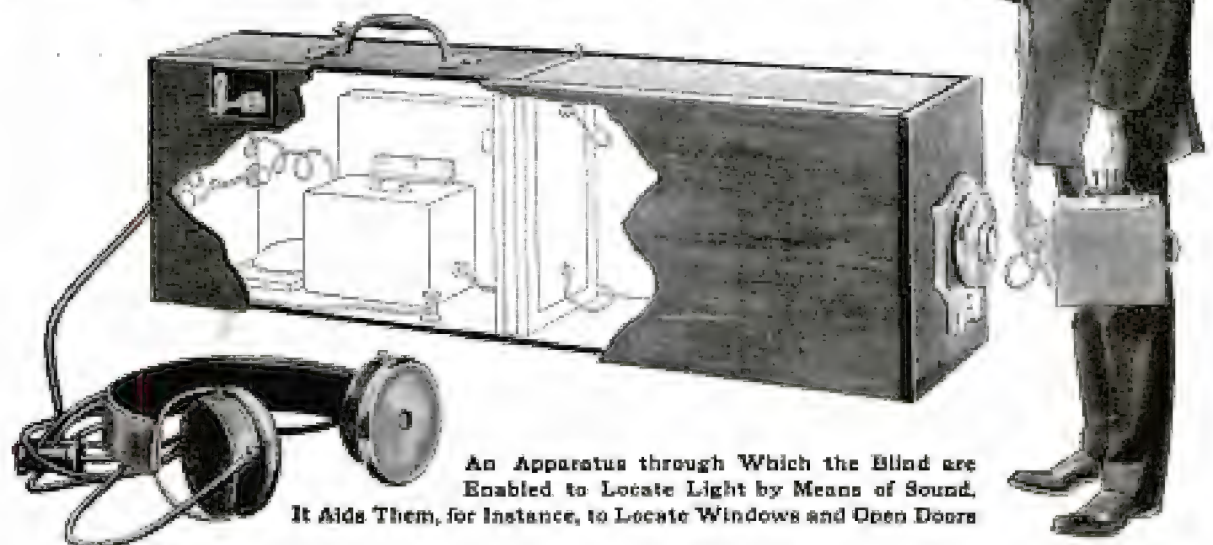
The expedition expects to make a careful survey of the Cuzco basin and its vicinity, with special reference to the age of the gravel deposits where human and other remains were found. This basin is in the Vilcabamba Valley in which eight Inca and pre-Inca cities and temples once stood, and which still remain in part. The discovery of the bones of human beings who lived more than 20,000 years ago, say 20,000, as an exceptionally conservative estimate, is the first authentic physical record of prehistoric man's existence in the western world.

THE BLIND MAY NOW "HEAR" LIGHT

Hearing the "sound" of moonlight appears a fantastic notion without commonsense foundation, but that such a thing is possible is the claim made by Fournier D'Albe, of the Birmingham (England) University, the inventor of the "optophone." At a recent test of the instrument, given in London, the value of the device for blind people was demonstrated.

The optophone is a small camera-like box, open at one end, which, if pointed at the light, causes the instrument to

produce sound which is transmitted by sensitive receivers of the type used in telephones. The accompanying illustration shows a blind man turning around, with the instrument in his hand, in order to ascertain the location of a window. The different tones, and degrees of sound, enable the user of



An Apparatus through Which the Blind are Enabled to Locate Light by Means of Sound. It Aids Them, for Instance, to Locate Windows and Open Doors

the instrument to determine the character of the body passing between him and the light. By aid of the receivers the man shown in the picture was able to count six people who passed in front of him by the intervals of light between them. "On a moonlight night," asserts the inventor, "you can hear the moon and when the sun is shining you would recognize it by the tremendous noise it would

make." Besides this use of the optophone, Mr. D'Albe expresses confidence that the invention will prove useful in discovering the light of stars that are not visible, as well as in many other directions. The invention is based on the well-known property of selenium of changing its electrical resistance under the influence of light. For three years Mr. D'Albe has been at work in perfecting his invention.

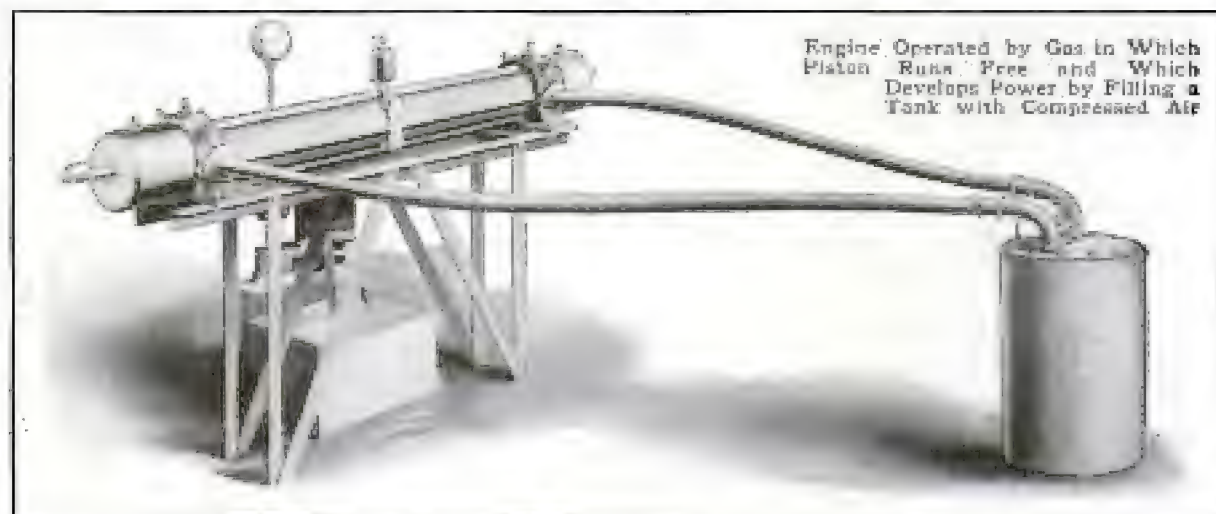
NOVEL GAS ENGINE FOR COMPRESSING AIR

An engine operated by oil fuel which has a free piston in a cylinder, and does not turn a flywheel, but simply pushes out air ahead of the piston as it shoots back and forth so that it fills a tank with compressed air is the novel idea of an Italian inventor. He claims that this method results in the development of a very large amount of power for the amount of fuel consumed.

The heavy piston, free in the cylinder, is propelled from one end to the other by the explosion of gas behind it. This pushes the air ahead of it out through a port, and then through a non-return valve to the compressed-air reservoir. After the piston passes the outlet ports, and is nearing the end of its trip through the cylinder, a charge of gas is automatically forced into the space ahead of the cylinder, while air is admitted automatically in the other end of the cylinder. The

continued trip of the piston then compresses the gas in the little space ahead of it to a point where the temperature rises enough to explode it, and thus sends the piston back to the other end of the cylinder, where the same operation is completed, the air and products of the previous combustion ahead of it being meanwhile forced out into the reservoir tank. Special provision is made for starting the engine.

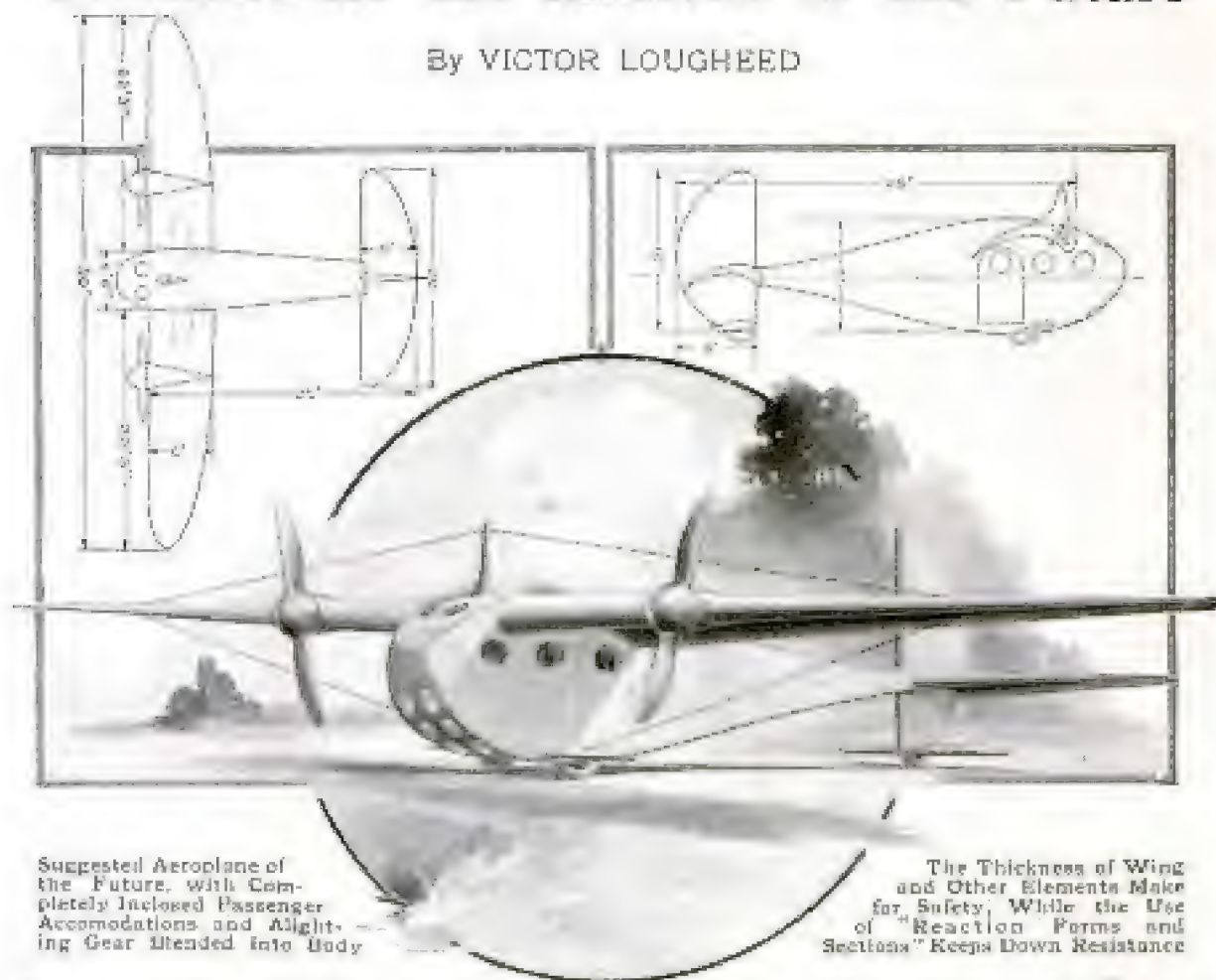
¶The Illinois Central Railroad publishes a magazine in each issue of which is run a series of full-page half-tone reproductions of photographs showing some of the common ways in which accidents are caused. With each picture are given the names of employees recently killed by such carelessness as those portrayed, to make the warning more effective.



Engine Operated by Gas in Which Piston Runs Free and Which Develops Power by Filling a Tank with Compressed Air

What Present-Day Aeroplane Development Promises for the Machine of the Future

By VICTOR LOUGHEED



Suggested Aeroplane of the Future, with Completely Inclosed Passenger Accomodations and Alighting Gear Blended into Body

The Thickness of Wing and Other Elements Make for Safety, While the Use of "Reaction Forms and Sections" Keeps Down Resistance

YEARS ago, when the automobile was haltingly evolving from the queer contraptions and crude constructions of the earlier experimenters, few indeed were the engineers of the time with the vision to see into the future and discern any part of the wonderful development in transportation which has come into being from such unpromising beginnings. Yet, if we reverse the analysis we simplify the conditions, and few are the automobile experts of today who cannot glibly trace back the essential elements of the up-to-date motor car—the multicylinder engine vertical in front, the cellular radiator, the channel frame, the ball bearings, etc.—to their veriest beginnings in the shops of a comparatively few European pioneers, who, untrammelled by precedent, substituted for the long current notion of a "horseless carriage"—as negative in its merits as in its title—the idea and the fact of the

"road locomotive," the king of the modern highway.

It is, therefore, but reasonable to believe that some practical idea of the aeroplane that the near future will produce can easily be gained by noting the advances that have already been made, for, it is obvious that in the development of human flight there are manifest the workings of similar phenomena. No more than the automobile has the aeroplane sprung, full-fledged, from the brow of some Jovian creator. The fact that the mob unfailingly demands heroes, to whom to accord credit for great achievements, need not blind more critical eyes to the profound differences between evolution and invention. And, as the months roll by, and the test of time proves always as sure as it always is ruthless, so is the way of progress strewn with the wrecks of things that have but incompletely served their

purposes, things that have not justified the high hopes of their creators, and things that have merely helped, rather than defined, the growth of an engineering industry.



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Early French Monoplane—a Characteristic Machine of the Type in Which the Whole Structure is Open Trussing, with No Effort to Reduce Resistances by the Application of "Reaction Forms"

Times without number, the most consistent, well-financed, and long-persisted-in efforts to revolutionize the automobile have been remorselessly ground into impotent failure by the irresistible advance of the types of construction which now prevail because they are the products of mechanical evolution rather than of individual invention.

So must it be with the flying machine, and so, just as surely as there has been an almost biological evolution of the steamship and the railway, must there ultimately disappear the freak forms of (and the more freakish substitutes for) the one soundly conceived, really progressing vehicle of the skies—the aeroplane.

Dismissing then from present consideration such follies as the gasbag, and the thin-surfaced, wire-encumbered, bodyless types of aeroplanes, as of no continuing interest unless as bottomless sinks into which to plunge labor and capital, and murderous devices with which to slaughter the foolish and reckless, there remain the

questions respecting the course aeroplane development is most likely to take.

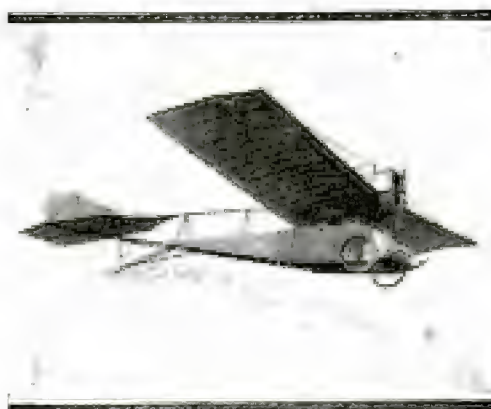
For a beginning, if the foremost flight engineers of the time were to attempt to visualize for the layman a reasonable conception of the aeroplane of the future, there probably is one basis, and one basis only, upon which substantial agreement might be sought. The aeroplane of the future must be *birdlike*.

Every added fact of flight accomplishment, and every new discovery in the reluctant science of aerodynam-

ics is most conclusively to this effect. There is not even the room for alternatives.

This is because in the aerial vehicle there is a condition not encountered elsewhere in the whole field of transportation. This condition is the complete immersion of the vehicle in a homogeneous fluid, every movement and reaction of which is subject to most definite laws, with safe and efficient operation absolutely conditioned upon proper interactions between *all* of the surfaces of the vehicle and the surrounding masses of air.

What can be more evident then, than the necessity for invariable and consistent adherence to the comparatively few fundamental principles of form that will normally interrelate with the similarly few and fundamental laws of the dynamic movements of elastic fluids? Is it reasonably conceivable or any way in evidence, for example, that the bird, devised by the same intelligence that devised the physical laws it operates under, is capable of anything



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A Suggestion of the Future Type. The Train Monoplane, which Proved an Excellent Flier, but Which Unquestionably would Present Lower Forward Resistances were the Space between Body and Wings Closed Up, and the Whole Central Structure Blended into a Single Smooth-Contoured "Reaction Body"

more than detail modification without wholly upsetting the harmony between its contours and the air streams, upon which its ideally safe and efficient flight depends?

The justice of these contentions admitted, further speculation is closely limited.

The aeroplane of the future, to be designed soundly, and built well, must be substantially a gigantic bird, differing from its natural prototype chiefly in such details as will be reasonably involved by the larger sizes, and substitution of a limited and simplified control for the complex coördinations between brain and structure in the natural device.

As in all mechanisms, of whatever types, there will be provided the results the case demands and tolerated the compromises the case permits. The first will usually be the problems and the second their solutions. And the correct combinations will prove invariably to be only those that are reasoned and tested out upon the broadest possible basis of scientific deduction and empirical check.

Already there exist tendencies that definitely point to at least the more immediate goals.

The speediest aeroplanes of today are not so generally the highest-powered as they are the most efficient.

The most efficient aeroplanes of today are blunt-bodied and thick-winged; these also are the strongest.

The safest aeroplanes of today are those in which controls are directional rather than stabilizing—leaving the latter function to be cared for largely by the form and interrelationships of the various surfaces, rather than dependent upon a constant juggling perform-

ance by the driver, or, worse, by some complex "automatic-balancing" contraption.

The launching and alighting of the most advanced aeroplanes of today can be from, or upon, either land or water, at the will of the pilot.

Such details as the number of propellers, their size, and their placing, have perhaps evolved to a less significant status than the more fundamental details just enumerated. Yet, even here certain main considerations are not to be escaped. As an example, the constant increase in body sizes, coincident with growing simplification of

running gears, would seem to suggest that in the ultimate machine there will be a blending together of these two elements—involving the superseding of a present anomalous duality of structure by winged bodies, automobile-like or houseboat-like in general type, with their lower portions directly exerting the "running-gear" function, and the wings simply mounted rather high upon them. A placing of the center of gravity less low than the center of volume will avoid



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The Maze of Struts, Wires, Tanks, etc., under the Body of This Deperdussin Monoplane Occasions More Head Resistance Than would be Set Up by a "Reaction Body" of Sufficient Size and Bulk to Inclose Them Completely

the objectionable pendulum effect of weight carried low, while the very small resistance of scientifically designed "reaction forms" will reduce to a negligible minimum the slightly unsymmetrical placing of the resistance.

This evolution of the body and alighting gear will in turn make increasingly difficult, however, the provision of room for large propeller swing that is so readily obtainable with many of the stilt-like structures at present in vogue.

Most obvious of the means of minimizing this difficulty will be the provision of twin propellers—a system that

has other important advantages (including the elimination of unbalanced reaction and gyroscopic effects) to offset its mildly objectionable complica-

jected area, but by the more scientific and bird-type construction, wherein the principle of the "reaction impulse" is made to nullify in large measure the head resistance. Even to the tension members of the structure must this principle be consistently extended, wherefore the aeroplane of the future may be reasonably expected to present only a few heavy and "streamlined" cables, in place of the multitude of fine wires so generally employed nowadays.



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Recent Nieuport Monoplane, in which the Shortness of the Landing Gear and the Low Placing of the Large Body Suggest That It would be Only a Slight Further Step to the Complete Amalgamation of These Elements

tion and added weight. Perhaps less obvious among the helps over the suggested obstacle will be the smaller thrust demanded by the more efficient machines of the future. Also, the increased huskiness of propeller blades of heavy reaction sections will lessen the need for liberal propeller clearance, now needed to preserve thin blades from damage through contact with grass, water, etc.

Because of the comparative safety of this as opposed to the alternative construction, the motors of the future machines will almost certainly be placed in front. This, in turn, with a single propeller, will almost demand its front placing, and with plural propellers is at least likely to influence the same placing, as that most simply and conveniently provided.

Structural integrity—immunity from breakage—must be secured in the future aeroplane as positively as it is secured in high-grade automobiles. Of the means to this fundamental condition of safety, there must be employed not only as good materials and better assemblage than is now common; there also must be employed members and surfaces of sufficient thickness to afford space for rigid trussing. And this, of course, will require the reduction of head resistances, not by the difficult, dangerous, and wholly unnecessary expedient of keeping down the pro-

jected area, but by the more scientific and bird-type construction, wherein the principle of the "reaction impulse" is made to nullify in large measure the head resistance. Even to the tension members of the structure must this principle be consistently extended, wherefore the aeroplane of the future may be reasonably expected to present only a few heavy and "streamlined" cables, in place of the multitude of fine wires so generally employed nowadays.

Another probable factor of future safety, wholly independent of safety obtainable by sound design and substantial construction, will doubtless appear in a more general recognition of the limitations of aerial navigation, leading to the same sort of cautious supervision and restriction of use that applies in navigation of the sea, where no mariner with his sanity about him would attempt fancy evolutions along a rocky coast in a storm, or put out of port in a typical Gulf hurricane or South Pacific typhoon. Indeed, instead of the reckless flying that has become so common with half-developed machines—flying from the roofs of buildings, under the bridge at Niagara Falls, etc.,—there may be expected a safe and sane flying from large, prepared land or smooth water areas from selected start to specified destination.

The materials of which the aeroplane of the future will be built are likely to remain much the same as at present.

Fabric would seem in every way superior, in strength, durability, and ease of application, to wood and sheet metal, sometimes proposed as substitutes for it for wing surfacing. The use of fabric for the sails of boats, which involves analogous requirements, is rather suggestive on this score.

Wood also possesses superlative merits, and although steel may sup-

plant it for wing bars and some elements of the framing, wood is likely to persist for a long time in rib construction, body work, etc.

Of course, the aeroplane of the future will afford complete inclosure of the passengers, because of the reduced resistance to be secured in this way, as well as for reasons of comfort and safety.

In the matter of finish, there is no question that better weatherproofing than is now made will be necessary, as the only possible means of preventing rapid deterioration. If, in addition to this, the paints and varnishes employed can be made at least fairly fireproof as well, the increase in safety is one to be sought for.

The question of the power for future flying is likely to require less special solving than at present. The high efficiency of the machines of the future will make high reliability more important in motors than light weight and extreme power, so probably the aeroplane motor will always remain substantially a close counterpart of the internal-combustion motors in motor-boats and automobiles.

The controls of the future machine, as has already been suggested, are likely to become purely directional rather than stabilizing, making them measurably surer in operation and somewhat simpler to manipulate.

The question of whether "wing warping" is to endure will be regarded by many as very debatable, and there is much reason for supposing that its place may be taken by controlling systems that overcome its objectionable feature of increasing the resistance on the side of the machine that requires to increase in speed.

The question of speed can be very well left to rest on present accomplishments. Already one French monoplane has repeatedly proved capable of a speed of 105 miles an hour in going round and round a closed course, with the reasonable probability that it can do 115 or 120 miles in straight-away flying. The aeroplane of the future doubtless will be faster, but if it even remains only as fast—probably with less power than is now required—its utility, insofar as this relates to speed, will be superior to that of all other vehicles.

DETROIT'S ILLUMINATED WATER COURT

One of the finest features of this year's "Cadillaqua" at Detroit, the birthday party held by that city to celebrate its founding by Cadillac in 1701, was the court of honor erected in the river between Belle Isle and

the Detroit shore, a view of which is shown in the accompanying illustration.

Constructed on piles, it was 1,500 ft. long and 300 ft. wide, with three immense fountains as the central fea-



The Cadillaqua Water Court by Day, Showing Cadillac Memorial Fountain

tures. Two huge galleys were provided to accommodate bands and musicians, and pennants, streamers, and Indian shields decorated the posts of the court. In the daytime the court presented a gay and inspiring

scene, but at night, with its fine illumination, the scene was magnificent. The fountains, with water falling in sheets from one bowl to another, were illuminated with red, white and green lights.

GOBELIN TAPESTRIES WOVEN FROM THE REVERSE SIDE

The famous Gobelin tapestries, which are still turned out by the historic Gobelin factory, are woven from



Weaving a Gobelin Tapestry from the Reverse Side

the reverse side. The weaver works facing the back side of the tapestry, and, every once in a while, parts the threads and looks through at the mirror in which the design is reflected. Some of the tapestries take years to make, and sell for as much as \$30,000. The factory was originally founded by the Gobelin family, but is now owned by the French government.

NEW RECORD FOR WIRELESS FROM AEROPLANE

Most persistent and successful attempts are being made by French army officers to render thoroughly practical the application of wireless telegraphy to aeroplanes. The latest achievement in this field, by Lieut. Manger-Devaremmes, consisted in the sending of messages to St. Cyr, France, while in flight over the surrounding country. Communication was easily maintained from as far away as Meaux, a distance of 15 miles, and hopes based upon new experiments and calculations are entertained of soon increasing the distance to from 90 to 130 miles, by suitable changes in the apparatus. A point of interest to the wireless enthusiast will be the fact that it has been definitely determined that a mere substitute in the way of an equivalent of the usual antenna is insufficient to secure useful re-

sults, and that there must be an equivalent of the ground as well.

By employing the wires of the machine as the antenna, and trailing a length of wire for the other end of the circuit, a sufficient capacity is secured in the two elements to insure the effective oscillations of high-tension current upon which success in wireless transmission is now known to de-

pend. In gauging the comparative quality of different feats of wireless telegraphy from aeroplanes, it is especially important to distinguish between mere feats of receiving, and the cases in which actual communication

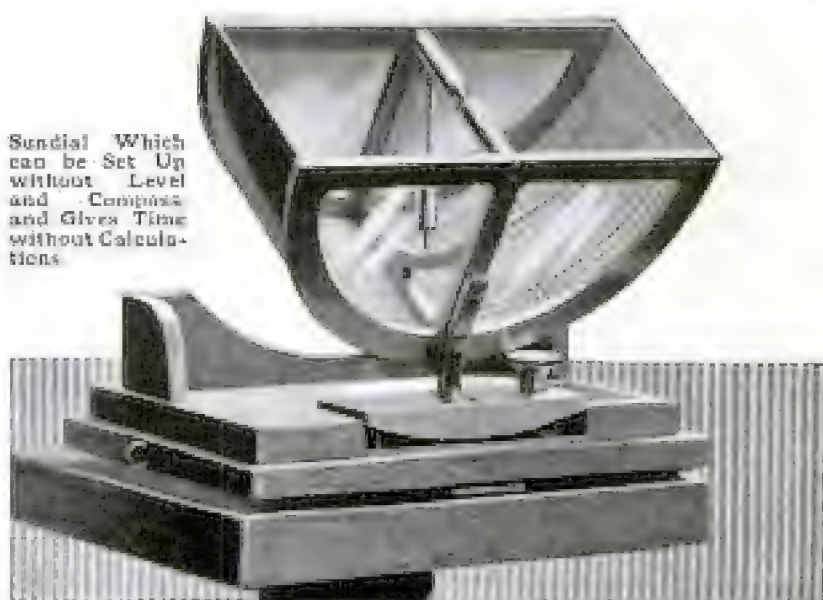
both ways is maintained. It is comparatively simple to provide an apparatus that will receive messages, but when it comes to sending for any distance the problem becomes much more difficult.

SUNDIAL WHICH MAY BE READILY SET UP

A sundial which can be readily set up without the aid of a compass and level, and used without the otherwise necessary involved calculations, has been constructed in England. The essential part of the instrument is the flexible, reversible dial, which, in fact, is the part which obviates all calculations and allowances when the time is read. For an instrument of its class it is of such unusual accuracy that it has been termed a solar chronometer. Briefly described, the instrument, which is made of metal, consists of a rectangular frame attached to a curved plate which carries a flexible dial. The dial is reversible, and is marked on its two faces with specially curved "hour lines" and straight "date lines," each face containing dates for six months. A polar axis is fixed to the frame and formed so as to project the shadow indicating the time, its special shape conducing to great accuracy. Latitude is indicated on a graduated arc by a freely suspended pointer. The instrument is attached to its base by a ball and socket with clamp, by means of which it can be adjusted and set in any position and at any inclination. The possibility of placing the solar chronometer in the meridian by its own indications has been taken advantage of for utilizing the instrument as an astronomical compass. For this purpose a simple attachment is pro-

vided, by the aid of which a line can be run true north and south independent of local or magnetic influences. This attachment consists of the usual graduated circles with a double sight fitted at each end for sighting back-

Sundial Which can be Set Up without Level and Compass and Gives Time without Calculations.



ward or forward. It can be placed horizontally at right angles to the rectangular frame, which lies east and west when the instrument is in position. It follows that a line through the sighting vanes runs north and south.

To adjust the instrument for latitude before taking an observation, it is placed on any surface in the sunshine; the pendulum suspended above the latitude arc is allowed to swing free while the dial holder is tilted until the pendulum points to the latitude of the place on the arc, the latitude having been obtained from an atlas. In order, next, to place the instrument in the meridian, the shadow of the meeting points is brought on to the date

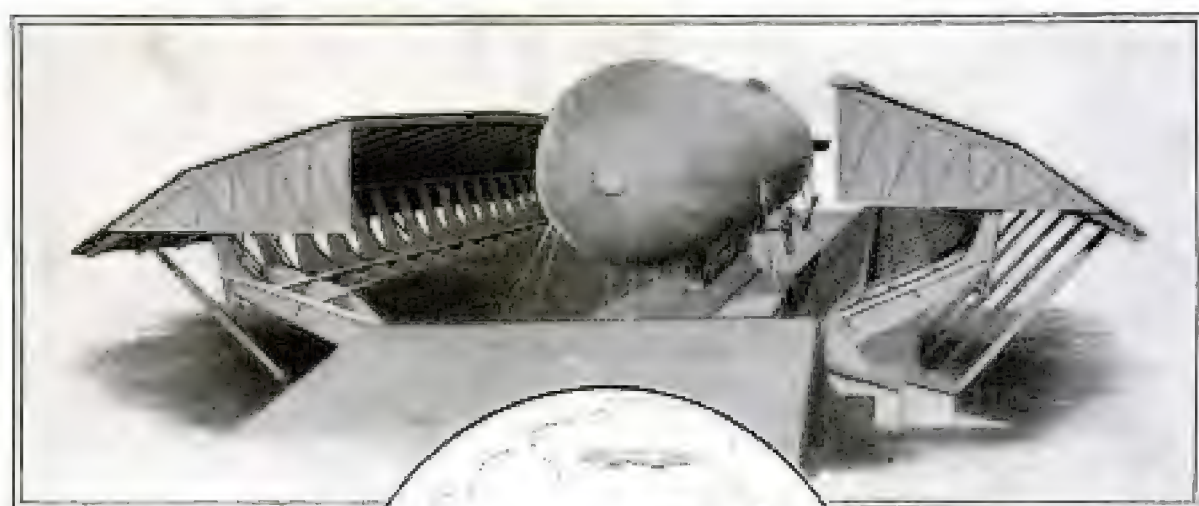
line of the day by turning the whole instrument with its base round bodily. Careful adjusting is required here.

The position of the shadow of the meeting points on the dial will then indicate the correct time without any calculation or allowance. The time indicated will be either standard time or local mean time, according to the setting of the flexible dial in the metal curve. The hours are indicated by thick, continuous curved lines marked with Roman numerals and each hour is subdivided to ten minutes by fine and dotted curved lines. The ten minutes can be subdivided mentally, the shape of the shadow rendering it easy to estimate time to within one or

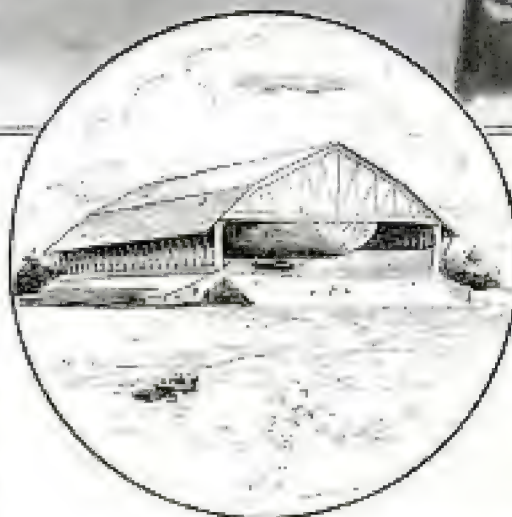
two minutes. The most favorable time for an observation is before 9 a. m. or after 3 p. m. As to accuracy obtained in latitudes between 30 deg. north and 30 deg. south of the equator, observations made between 7 a. m. and 8 a. m., and between 4 p. m. and 5 p. m. will give results to within about one minute of true time, while in more northerly or more southerly latitudes, observations made at the same hours will give the correct time within about two minutes.

The instrument can be set to indicate either local mean time, or the standard time of any country. For example, a dial in use in Dublin could be set to indicate Greenwich time.

A NOVEL GERMAN HANGAR



The working model of a novel dirigible hangar which created much interest at Berlin's annual aviation exhibition is shown in the accompanying illustration. It parts down the center of the roof and opens completely out, leaving the dirigible in the open air. The opening and closing is accomplished by a mechanism some-



Upper View—Model Hangar Which Opens at Top to Release Airship

Lower View—Appearance of Hangar Closed with Dirigible Lodged Within

what similar to that used on bridges of the lift type, counterbalances being provided.

¶In Utah the sea gull is a sacred bird, severe penalties being reserved for persons who kill them. In the early days of the Mormon state sea gulls rescued the crops by killing and eating swarms of grasshoppers.

CONQUERING MALARIA IN ITALY

Marked success has attended the efforts of railway and health officials in Italy who for several years have been waging a fight against the malarial mosquito along the lines of Italian railways. Thirty years ago conditions were so bad in a certain section of the country that one railway had to maintain a triple staff in order that regularity of service might be assured. After the famous discovery that the mosquito was responsible for the prevalence of the disease an earnest defensive campaign was instituted. The work was hindered by the opposition of ignorant employees of the railways who were skeptical of the methods advocated by scientists. These included liberal dosing with quinine, the wearing of gloves and gauze hoods and the covering of doors, windows and chimneys of houses with a wire netting of fine mesh. As a result of the precautions taken, the percentage of fever cases in infected districts has been reduced from 87.12 in 1880 to 13.26 in 1911.

A FRIENDSHIP GARDEN

A sentimental idea for an odd corner of the flower garden is to use it as a "garden of friendship." Each friend, on his or her first visit to the garden, places a small plant in this corner, and beside it a metal label bearing the name of the planter. The plant is then left to grow and forms a living reminder of the friend.

FIFTY-TWO MULES HAUL GREAT PIPE

All mule-team records were broken, it is declared, by the builders of the



Team of 52 Mules Hauling 24-Ton Steel Pipe

Los Angeles aqueduct when fifty-two mules, as shown in the accompanying illustration, were hitched together to transport steel siphons used in constructing the aqueduct. A single jerk line was used in handling the team. In most instances the weight of the steel sections was 24 tons. The total length of the siphons used in the aqueduct was about 14 miles.

The larger part of the steel used was forwarded by freight in plates and riveted in the field. When making the heavier pieces, for use in the largest siphons, it was found that they would have to be treated at the steel shops and shipped complete. Then

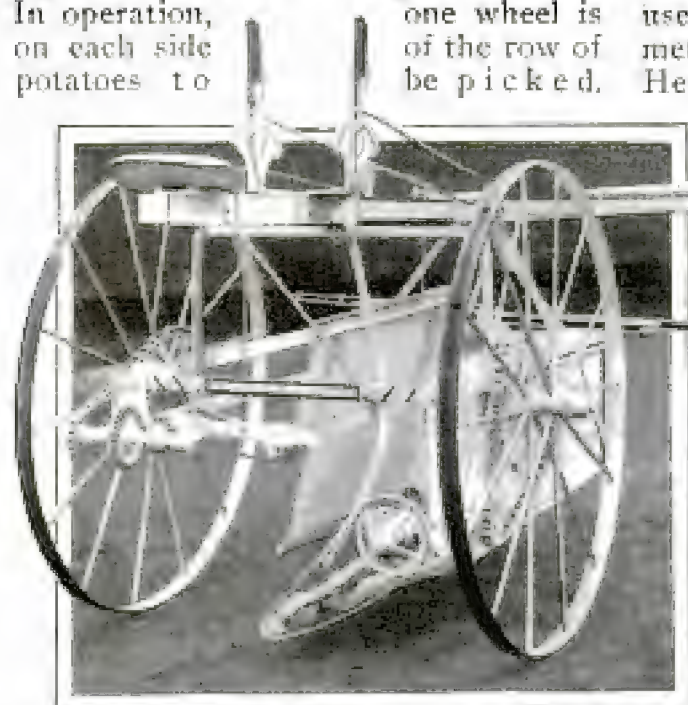
there was presented the problem of hauling a 24-ton pipe, often 11 ft. in diameter, four miles on rising ground. Employment of the 52-mule team solved the problem.

During the progress of the work the experiment was made of supplanting

the mules by caterpillar engines but whereas the cost by mule power was about 12 cents a mile per ton, the cost by engine ran to 29 cents. With this showing in economy, it was only natural that the mules were "put back on the job."

MACHINE CAPTURES AND KILLS POTATO BUGS

A practical device for disposing of potato bugs without poison is now being manufactured in large quantities. In operation, one wheel is on each side of the row of potatoes to be picked.



Bug-Killing Machine, the Revolving Plates Brushing the Bugs into an Apron

Two revolving plates, tipped with canvas, rapidly brush the bugs from the vines over into the apron shown near the right wheel. At the bottom of this apron the edge is turned up so as to form a gutter or trough and thus prevent the bugs from falling to the ground. In this trough is a small spiral conveyor which carries them toward the rear, where a pair of steel disks crush them and drop them back onto the ground.

Adjusting devices, which are easily controlled by the driver from his seat, are provided for different heights of vines.

NEW METHOD OF PROOFING WING FABRICS

In the factories of the big aeroplane constructors of France, England, and Germany, there has recently come into use a considerable innovation in the methods of finishing aeroplane wings. Heretofore it has been the practice, with the builders of the best machines, to cover the sustaining and other surfaces with the rubberized fabrics manufactured for this purpose by the tire companies. The experience of thousands of miles of flying, however, has disclosed considerable shortcomings in rubber used for this purpose, so the difficulty of stitching through and applying the coated cloth, combined with its tendency to loosen and tighten—even to the extent of tearing loose from the framing—with changes in temperature and weather, has caused much attention to be directed toward the search for a substitute. Of these, the most successful, and the ones at present most widely in

use, consist of collodion varnishes made from the new noninflammable acetyl-celluloses. These are applied after the wing is made, thus facilitating its manufacture, and protecting the seams as well as the surface proper. Also, by their use, it is found possible to secure and maintain any desired tautness of fabric. All ordinary exposure to water, sun, and cold weather are without deleterious effect, and the fireproof quality, while not the best that might be desired, is measurably superior to that of the rubberized fabrics. Not the least of the merits of the new process is its cheapness.

AUTO TIRES AFTER USE IN RACE

Automobile racing wears out tires in a matter of minutes, as compared with weeks of ordinary running, due largely to the tearing effect on the tires when curves are rounded. The accompanying photograph shows the condition of two tires which saw service on the Indianapolis speedway.



Courtesy Motor

Automobile Tires after Use on Car
in Indianapolis Racing

While King George V of England is rated as a very great man among his subjects and receives all sorts of tributes of respect, in the London telephone directory he gets no special favor, his private telephone being "Westminster, 832." The telephone number of the President of the United States at Washington is "Main, 6," while President Madero's of Mexico is simply "Negra, 10."

HOLE - DIGGING AND POST - SETTING AUTOMOBILE

A motor truck which not only lifts and sets telephone and telegraph poles in position but digs the post holes as well, is revolutionizing this department of work in the larger cities of the country. Under ordinary conditions the apparatus, operated by two men, can dig the holes and complete the setting of two poles in an hour, while the average for a gang of nine men and a foreman, with the usual equipment of manual labor, is not more than a pole an hour and the work is much heavier.

The pole-setting derrick is located on the rear of the truck and is supported by a transverse beam. The drilling apparatus, also at the rear of the truck, is driven by the motor through a winch connected by an endless chain to a pulley which has a threaded center and is fixed to the bracket carrying the

drill. The drill may be driven into the earth a distance of $6\frac{1}{2}$ ft., after which the gear shaft of the motor is reversed, thus reversing the winch drum, and the rope running through pulleys at the top of the

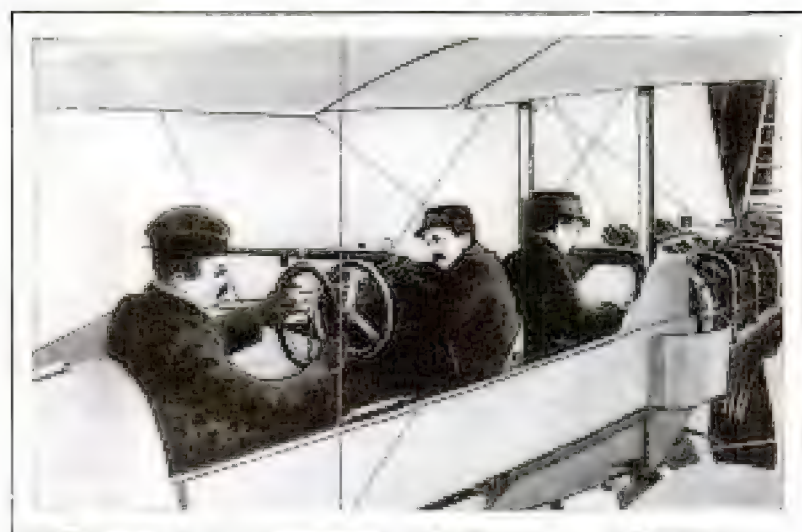


Apparatus Which Digs Post Holes and Lifts and Sets the Poles in Position

derrick and attached to the drill draws the latter out of the ground together with the earth attached.

THREE-SEATED MILITARY AEROPLANE

Among the French military aeroplanes recently turned over to the army are several of the Breguet type of monoplanes. These machines are three-seated, accommodating the pilot and two men. The positions the three men occupy in the machine are shown



One of the Three-Seated Monoplanes of the French Army

in the accompanying illustration. As here seen an officer is seated where he can study his military maps and make diagrams of an enemy's position, while the private soldier is handling a rifle as he would were one of the enemy's aeroplanes giving chase.

LIME AS A FOOD AND CURE FOR MANY ILLS

A teaspoonful of chloride of calcium, three times a day, dissolved in water, is healthful and nourishing, according to the German professors Emerich and Loew. Lime, if taken in slight quantities as food, they contend, is a preventive and a cure of many physical ills which now afflict humanity, increasing the vitality of the organism, protecting it from harmful mi-

crobes, and curing inflammatory affections.

Instead of throwing away the shells when one eats eggs, it would be better to eat the shells and discard the yolk and white, according to the personal view of these professors.

RAILROAD TO FIGHT MOSQUITOES

Extermination of mosquitoes along its lines will be attempted by the Illinois Central railroad through the employment of goldfish minnows, a natural enemy of the insects. The chief surgeon of the road is responsible for the experiment which will be the first of the kind attempted, so far as known. All stagnant pools, breeding places of the mosquito, will be stocked with the minnows and as all minnows eat the larvæ of mosquitoes, it is believed the destruction of the pest will be rapid and complete. In this work it is necessary to

use the goldfish minnows, as they are the only species able to survive in stagnant water. In cleaning up the breeding places it is hoped to stamp out malaria and typhoid fever, diseases for which the mosquito is held chiefly responsible. The experiment will be carried out in all states traversed by the Illinois Central, though the greatest benefit is expected to result in the states south of the Ohio River, where there is much swamp land.

¶ In the hope of finding a commercial substitute for gasoline, Charles Y. Knight, an American now residing in Warwickshire, England, has established a laboratory and is experimenting with shale oil and other indigenous fuels.

READING A WHOLE PAGE AT A GLANCE

An eminent eastern eye specialist reports, in the Journal of the American Medical Association, the case of a patient, a highly intelligent, educated man, a great reader, who could at a mere glance of a second or two, see and read a whole page of an ordinary book and know thoroughly its contents. This depended on a pathologic or abnormal condition of one of his eyes.

The person with normal vision can see distinctly, without moving his eyes, only a few words in each line and must move his eyes constantly in reading. The reason is that in the retina, the structure at the back of each eyeball on which the image is received, there is a small area near the center, the macula, on which is focused and defined distinctly a certain small portion of the object looked at, and the outer portion of the retina sees the remainder of the image in diminishing degree of distinctness the greater the distance from the macular area. The reader can prove this for himself. On looking at this page one can see the letters and words on the whole page, but can read only a few of them at a time without moving the eye, even by a special effort. The macula of each eye conveys a similar impression to the brain through the optic nerve, and they are converted by the brain into a single image. This produces what is called single binocular vision. It is true, however, that even in normal eyes with single binocular vision one eye is the dominant or fixing eye, the other eye following the dominant one. This is the right eye in right-handed persons and the left in left-handed persons.

The gentleman in question in early

life had had normal vision, with a dominant right eye, but vision in the macular area of this right eye had been destroyed by an inflammation some years

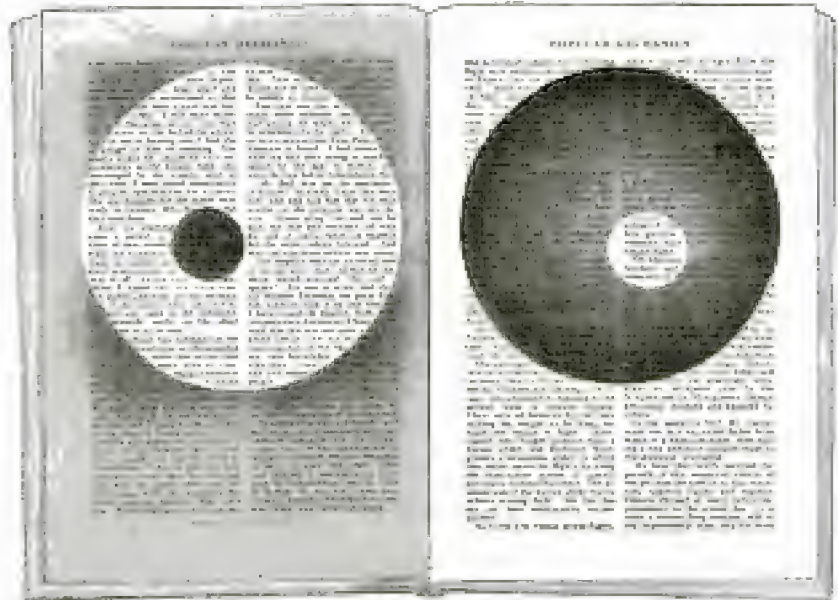


Fig. 1—Abnormal Eye of Man Who Could Read Whole Page at a Glance, the Black Spot, or Macula, Being Blind and the White Portion Recording Images Clearly

Fig. 2—Diagram of Normal Eye, the Clearness of Vision in Different Parts of the Retina Being Indicated by the Amount of White Space

later. Nature had then responded to the voluntary efforts and practice of the patient and the whole surrounding portion of the retina of the right eye had gradually become more sensitive and capable of giving distinct definition to images thrown upon its whole area; but in the central or macular area of this eye he was entirely blind. The condition of the two eyes is shown in the accompanying diagrams. In Fig. 1, representing the retina of the abnormal eye, the black spot shows the blind macular area; the outer clear portion represents the large area of clear definition of images. Figure 2 shows the normal eye, with normal macular area, in which definition of objects is distinct, the outer dotted portion representing the remainder of the retina in which definition becomes more indistinct as the periphery is approached. It will at once be seen that the normal eye supplied the central deficiency of the abnormal eye, and the enormously increased

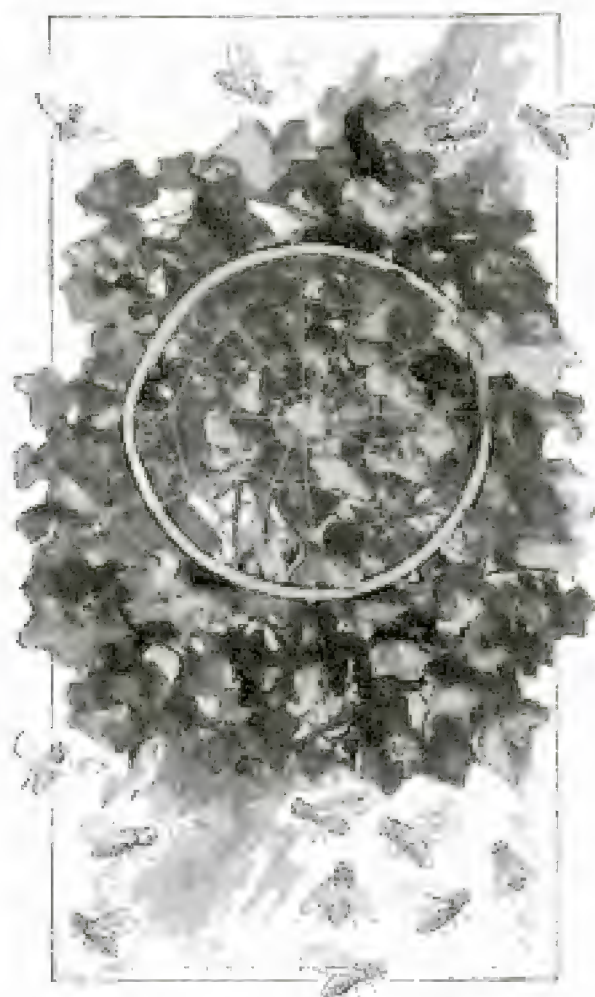
area of distinct vision in the outer portion of the right retina enabled the patient to see and read at a glance the whole page. The ability to read a whole page in this way developed only in middle life, years after the injury to his right eye.

It is worth recording, too, that this gentleman also had a marvelously re-

tentive memory and could remember whole passages or pages of poetry, or other matter, which he could acquire almost instantly with his abnormal visual powers, and he thus had a tremendous advantage in the acquisition of knowledge, over the ordinary individual who is really handicapped by two merely perfect eyes.

ARTIFICIAL SPIDER'S WEB AS FLY CATCHER

The "swat-the-fly" crusade has been responded to even more enthusiastically by the general public in England



A "Tanglefoot" Imitation Spider's Web for the Catching of Flies.

than in America, and particularly by the younger generation. Many ingenious fly-killing or capturing devices have been constructed by amateur fly slayers, one of which is an artificial

spider's web, such as that shown in the illustration.

The artificial web is made by stretching strings across a child's wooden hoop, or an old barrel hoop, in imitation of the work of a spider, and then these strings are painted with sticky material. A piece of meat or fish, placed in the web, attracts the flies.

THREE MILLION DOLLARS IN MUSHROOMS

One of the most important industries carried on in the suburbs of Paris is that of mushroom growing. To one who has never investigated this industry the methods in vogue are of special interest. In the various districts surrounding the French capital there are numerous old quarries and in these subterranean caverns mushrooms are planted and grown to maturity. Scattered all around one may see quadrangular wooden towers which are the shafts used for ventilation of the quarries. Some of these were the source of the stone and plaster used by medieval builders in erecting great public edifices in Paris.

In general they consist of a labyrinth of low and narrow chambers. In them are found conditions of temperature and humidity favorable to the culture of the mushroom. Provision for ventilation is essential and wells are dug for supplying the large amount of water necessary in this form of "farming." Another indispensable thing is horse manure, preference being given to the kind which is the product of highly nitrogenous food. Before the manure is taken

underground it is submitted to the action of the air for three weeks and is turned over from time to time to retard the process of fermentation. After lowering the prepared manure into the galleries, workmen arrange it in rounded beds which are carefully alined along the sides of the galleries. In these beds the mushroom spores are germinated. There are 250 mushroom "installations" in the vicinity of Paris and 1,000 workmen are employed.

The value of the product, which is much sought by the gourmets of Paris, is about \$3,000,000 annually.

TWO UNUSUAL STEAM-PIPE BENDS

The unusual pipe bends shown in the accompanying illustrations were made for the purpose of overcoming the vibrations in steam-supply lines, set up by the cutting off of the engine valves when the pipe connections are short.

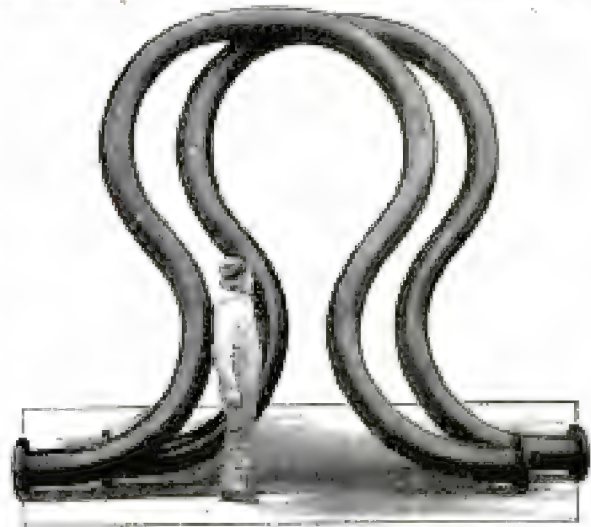
The circle expansion-pipe bend was installed in a plant in St. Louis, Mo., where the connections on boilers and headers in the original installation of the steam-pipe line were very short. In operation it was found to be impossible to overcome vibration and expan-



Nevel Circle Expansion Pipe, Installed to Overcome Vibrations in a Steam Line

sion with a straight pipe line. The pipe bend contains 34 ft. of 8-in., 28-lb. pipe.

The "N" pipe bends shown in the other illustration were made for installation in a plant in Lethbridge,



Unusual "N"-Shaped Bends Installed in a Canadian Plant in Preference to Sliding Expansion Joints

Canada. The working steam pressure of the line is 160 lb. The engineer of the plant preferred to take care of expansion with these bends rather than with sliding expansion joints.

THE CORK USED FOR CARBURETOR FLOATS

The cork used for floats in carburetors must be of the best quality obtainable. The manufacturer of one of the best-known types of carburetors imports the material from Spain and Portugal, where the best cork-oak trees grow. The trees must be over 40 years old before the bark is available for cutting, and then the cork can be cut only once every eight or ten years.

Being very firm and close in texture, composed of millions of tiny cells, each of which contains, according to *Motor Age*, a bit of entrapped air, hermetically sealed, cork is especially adapted for carburetor floats. Also, its peculiar cellular structure gives it an exceptionally low heat conductivity. The cork floats are not affected by heat changes, either by extreme heat or cold, moisture, or boiling gasoline.

Each cork float receives three coats of shellac in preparation for use in the carburetors.

FERTILIZER FACTORIES ON SHIPBOARD

Blubber and whalebone are no longer the only source of profit in the whaling business. When whales were hauled harpooned, the effect on the carcass was such that it soon sank. In those days the whale's body was lashed along the side of the ship, the blubber torn off in great strips and hoisted into the trying vats. After detaching all the available blubber, removing the whalebone from the mouth, and making sure that no ambergris had remained undetected, the remainder of the carcass was cast off as food for the myriads living in the lower depths.

The modern method of killing whales is by shooting them with an explosive bomb which penetrates the body of the whale for several feet and then explodes, causing instant death. A whale killed in this manner will float for weeks. Recently this fact was taken ad-



Totem Poles, Made on Electric-Light Standards, Lined the Streets of Seattle at Its Annual Carnival of the "Golden Potlatch"

vantage of by a whaler who cruises in the vicinity of the Cape of Good Hope. At a convenient point on shore he built a modern fertilizer plant, completely equipped with the most modern American machinery. Working within a radius of 300 or 400 miles from this plant, he tows his kill ashore and after working up the whale oil, whalebone, ambergris, etc., converts all that remains of the body into a high-grade fertilizer. His profits were at once greatly increased and his example soon followed by others in the same line of business.

During the past year another enterprising whaler has fitted up his ship as a floating fertilizer factory. He has installed enormous American fertilizer driers, large presses, mills and tanks, and thus is not confined to a limited radius. He hunts his prey where he may and without loss of time immediately converts the whole carcass into merchantable commodities.

In the days when all communication with the far east was by sailing around the Cape of Good Hope, many weird stories were told of phantom ships manned by ghostly figures and often accompanied by most disagreeable odors. These were supposed to be the haunting spirits of vessels whose entire crew had perished by plague, and were a source of great terror to the hardy seafarer. In the future, whenever a boat passes to the lee of one of these fertilizer ships, the sailors will be reminded of those strange tales of long ago.

WARNING AGAINST "SAFETY" FLANNELETTE

The British Fire-Prevention Committee warns the public against what is known as "safety" flannelette. A series of tests were made with this kind of flannelette and the material flamed very rapidly and in a dangerous manner; so much so, in fact, that the whole amount tested was consumed within a few seconds.



Front Elevation of Low-Price Concrete-Block House

WIRELESS IN OUT-OF-THE- WAY PLACES

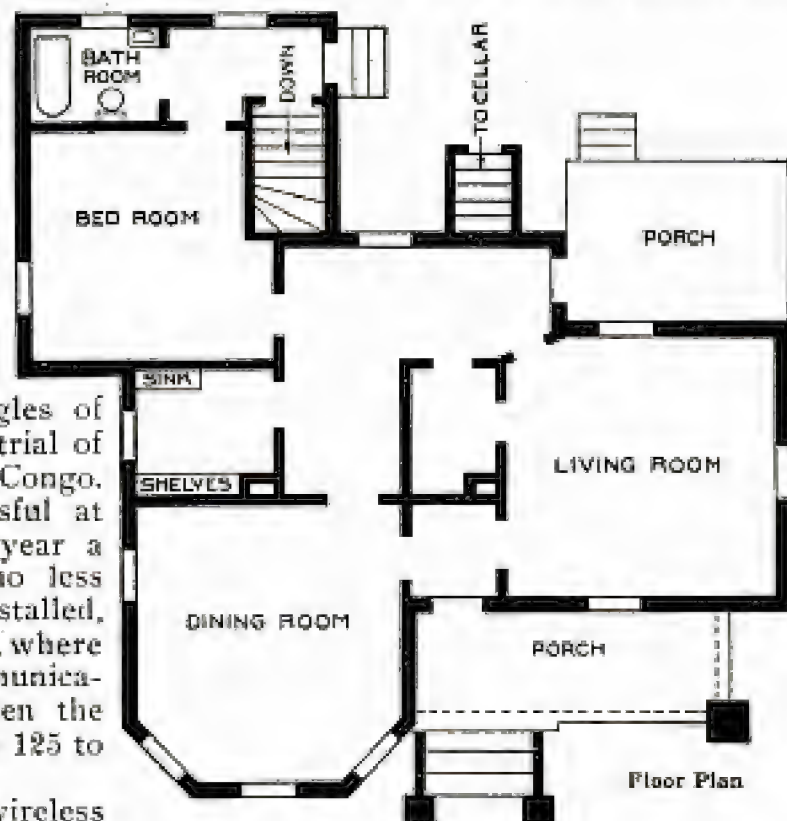
The suitability of the wireless telegraph in unsettled, out-of-the-way places of the world has already been proven by Belgium in the Congo Free State, and the German government has recently given a wireless company concession to install and operate a number of stations in German New Guinea and on several of the Caroline Islands.

The difficulty and enormous expense of erecting and maintaining ordinary telegraph lines in the jungles of Africa resulted in an early trial of the wireless in the Belgian Congo. This did not prove successful at first, but during the past year a wireless system totaling no less than 3,000 miles has been installed, so that all the main villages, where white men live, are in communication. The distances between the wireless stations range from 125 to 350 miles.

It is expected that the wireless stations in German New Guinea will be ready for operation early next year.

HOUSE BUILT OF CONCRETE BLOCKS FOR \$2,000

Although there are many forms of concrete houses, either monolithic or built of blocks, few of them possess the



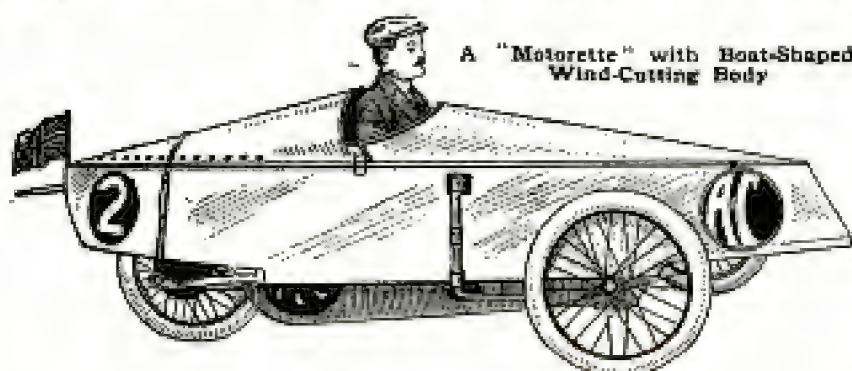
features of the house shown herewith, built at the cost of \$2,000, on the basis

of prices of materials and labor in Indiana. The concrete blocks are 8 in. by 8 in. by 16 in. and are faced with coarse sand, in a mixture of 1 part cement to $1\frac{1}{2}$ parts sand. The body mixture is of 1 part cement to $3\frac{1}{2}$ parts bank gravel. It will be noted that concrete lattice blocks are used in the fence and on the porch, and concrete

balls surmount the newel posts. It is stated that the square part of the columns is of 4 in. by 8 in. by 16 in. block, while the caps on the fence and balustrade and on the columns, also the base of the columns as well as the base of the newels, were cast in wood molds locally made, as were the molds for the window sills.

A RACING "MOTORETTE" AT BROOKLANDS

The "motorette" or three-wheeled motorcycle played a prominent part in recent motorcycle races at the famous

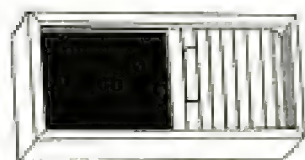


A "Motorette" with Boat-Shaped Wind-Cutting Body

Brooklands course in England. Among these little cars one of the most interesting was provided with a new wind-cutting body, which gave it a rather boatlike appearance. The marine effect was heightened by the flying of a little British flag at the stern.

STAMP PAD WITH ROLL-TOP

The fact that the ordinary stamp pad, inclosed in a hinged tin box, is liable to become soiled with dust, and is unhandy either because the cover



does not close tight enough, or too tight, has caused one stamp-pad manufacturer to place on the market a pad in a wooden box having a roll-top. The roll-top is so nicely fitted that a mere touch with the finger will open or close it.

LOS ANGELES HAPPENINGS IN WEEKLY PICTURES

Although motion-picture theaters are provided by several companies with sets of motion pictures showing the important and sensational happenings of each week in all parts of the country, Los Angeles is the first city in which the experiment of a strictly local "weekly," as such pictures are called, has been attempted.

The first weekly number was issued the latter part of June, and the experiment is being watched with interest by motion-picture concerns. The Los Angeles' company inaugurating the local weekly made arrangements with the newspapers of that city to receive immediate notice of every news story "breaking" within 100 miles, and two motion-picture camera operators were placed on duty to cover daily assignments.

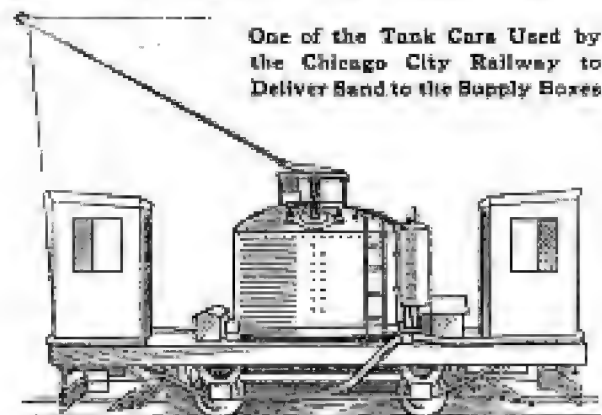
WILBUR WRIGHT'S LAST WORD ON AVIATION

That the aeroplane of the future must be perfected to the point where it can remain in the air once it has ascended was the contention of Wilbur Wright in a letter written by him shortly before his death. The letter was addressed to a well-known German airman and was received by him at the aviation grounds near Berlin. The difficulty, wrote the famous

American, is that "nature provides birds with the means of soaring without exerting themselves, while humans must devise artificial means of achieving the same results. The real problem now confronting us is to find out whether we, too, like the birds—once we are in the air—can stay in it indefinitely. The bird can do it. Why shouldn't men?"

CHICAGO CITY RAILWAY'S SAND-TANK CARS

The Chicago City Railway operates two specially constructed cars for the delivery of sand to the supply boxes from which the train crews fill the sand boxes on the cars. The supply boxes are located at some 75 different points. The ordinary single-truck car previously used for the transportation



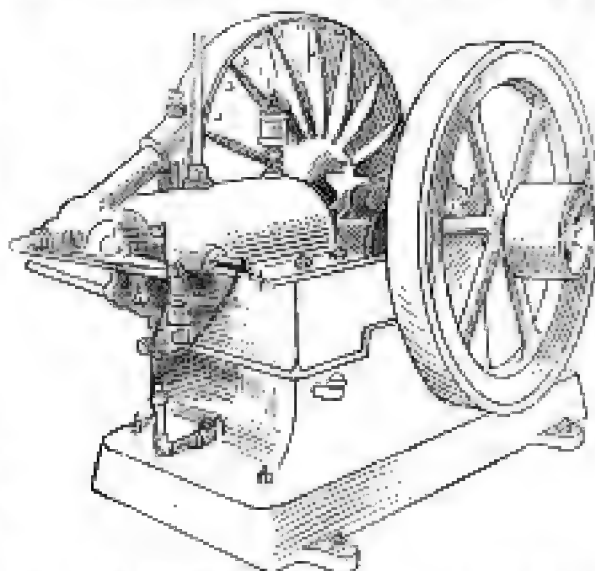
One of the Tank Cars Used by the Chicago City Railway to Deliver Sand to the Supply Boxes

of sand proved inadequate, so the company constructed two tank cars provided with unloading apparatus. The capacity of the sand tank is 24,500 lb. of dry sand up to the dome, the balance of the space being left for air storage. The sand is pneumatically discharged into the supply boxes through a 3-in. wire-wound hose.

EXHAUST GAS DIRECTED AGAINST FLYWHEEL

Of the many ways devised to utilize the exhaust of gas engines, the method applied in the so-called "compound gas engine" seems particularly interesting. In this engine the cylinder exhaust is discharged directly against one of the flywheels, which is

encased and equipped somewhat after the fashion of a turbine wheel. The



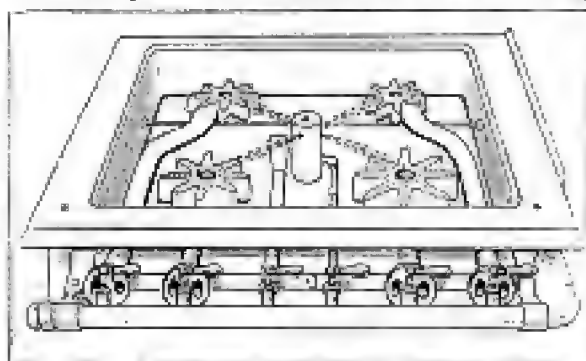
One of the Flywheels of This Stationary Gas Engine is Converted into a Turbine for the Utilization of the Exhaust Gases

exhaust gas is thus taken into a rotor which not only harnesses this force and increases the power of the engine, but also very effectively muffles the explosions.

It is claimed that the device can be used on most present types of engine.

FOUR-FLAME LIGHTER FOR GAS STOVES

The flame from the lighter shown in this illustration, shooting in four directions, will ignite any one or all of the four burners of the gas stove, by simply turning the gas key connected with it. A small protected light burns continuously in the dome, and the turning



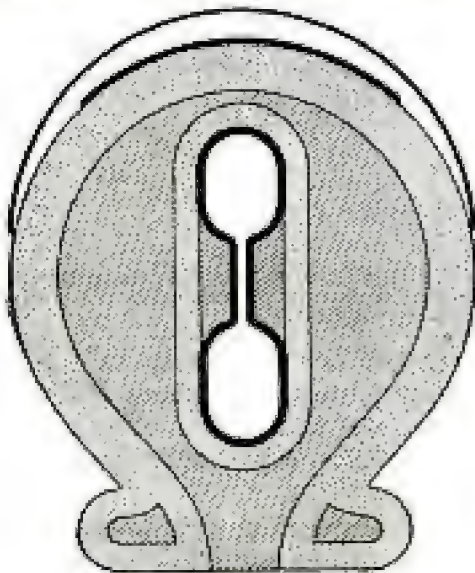
A Gas-Stove Lighter Which Projects a Flame to All Four Burners

of the key admits an extra supply of gas which is ignited and projected

across to the four burners. The continuous burning of the small flame is claimed to consume no more than five cent's worth of gas per month.

VACUUM TIRE INSTEAD OF PNEUMATIC

The pneumatic-tire problem, which has persisted since the early "safety" bicycle period, is solved at last, if the



Cross Section of Vacuum Tire

Brooklyn inventor of a new and radical substitute may be believed. He has just placed his invention on the market. The contention of the Brooklyn man is that the elimination of air, in other substitutes for the pneumatic tire, limits the elasticity of the tire to the degree of elasticity possessed by the substance of which the tire is composed. It is evident, he says, that a tire which depends for its easy-riding qualities on the compressibility or extensibility of solids never can compete with the pneumatic, since air has no elastic limit.

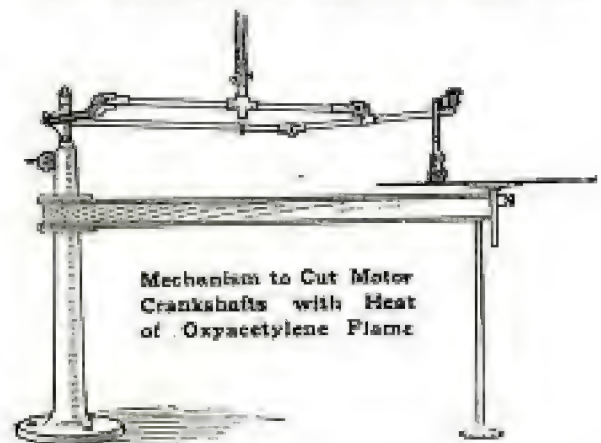
With these principles in mind he evolved what he terms a single-tube, wrapped-tread, vacuum tire, a cross section of which is shown in the accompanying illustration, the innovation being that the air is pumped out from the interior instead of being compressed into it. The air chamber, or rather the vacuum chamber, for very

little air remains after the pumping operation has been completed, is $\frac{1}{2}$ in. wide by $2\frac{7}{8}$ in. long when the tire is subjected to atmospheric pressure only. When the weight of the car is applied, however, the chamber tends to widen in the middle and this tendency is resisted by the pressure of the atmosphere which is exerted on the outside of the tire. Thus, according to the maker, the vacuum tire, like an ordinary pneumatic, depends for its resilience on air pressure, and yet blowouts are impossible, for the pressure is all external and the fabric is not strained. Punctures, although not impossible, need not necessarily occasion delay, for the tire is of sufficiently heavy construction to be used as a cushion tire.

PANTOGRAPH CUTS OUT CRANKSHAFTS

In the early days of the automobile industry the engine crankshafts were cut from thick steel plates at great cost. Cheaper engines became possible with the advent of drop-forged shafts. Recently, however, there has been a reversion to the old method of cutting the shafts from plates and this was made possible by means of the oxy-acetylene process. Essentially this is a method of applying an intense flame and burning the crankshaft out of the steel plate.

An eastern firm has now come for-



Mechanism to Cut Motor Crankshafts with Heat of Oxyacetylene Flame

ward with a short-cut on this process and the prospects are for even less costly shafts. It attaches the oxyacet-

ylene torch to a reducing pantograph, and dispenses entirely with the necessity of laying out the work on the steel plate. The pantograph consists of a frame standing on a pair of legs and supporting the work directly under the nozzle of a vertical torch. Elsewhere on the frame a table is fastened to support the flat blueprint which is twice as large as the shaft itself is to be. The pantograph arm, which is driven by an electric motor, extends over the table and the plate of 3-in. steel.

The operator merely turns on the motor and traces the blueprint. The torch thereupon eats its way along a similar, but smaller, path on the steel plate. It cuts curves and right angles with equal facility and will travel at the rate of 6 in. a minute.

FILTERING REFLECTOR FOR INCANDESCENT LAMPS

An ingenious means of directing full illumination on a certain piece of work or object, while the eyes are absolutely protected from any direct rays of light, is provided in a shade recently brought out. The shade consists of a smoked-glass shield having an adjustable metallic reflector hinged to it at the back. The shade is attached to the socket of an electric light by means of a spring clamp.



SAFETY PIN USED AS MAGNETO SWITCH

An exceptional use for a safety pin has been found by a motorcycle rider. The pin, which is of large size, is fastened to the handle bar by several windings of tape, and several layers underneath keep it from touching the handle. A wire is run from the pin to the magneto, and tape is wound around the top of the head of the pin

to keep the rider of the machine from getting a shock when his thumb touches it. Pressing down the head of

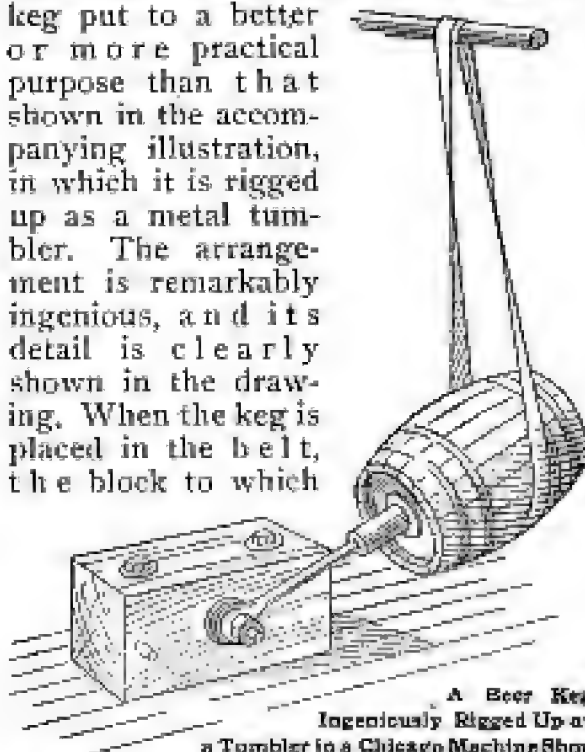


Safety Pin as a Switch on Magneto Wires of a Motorcycle

the pin so that it touches the handle bar short-circuits the current and kills the spark, thus stopping the engine.

BEER KEG USED AS METAL TUMBLER

The owner of a machine shop in Chicago insists that there never was a beer keg put to a better or more practical purpose than that shown in the accompanying illustration, in which it is rigged up as a metal tumbler. The arrangement is remarkably ingenious, and its detail is clearly shown in the drawing. When the keg is placed in the belt, the block to which



A Beer Keg Ingeniously Rigged Up as a Tumbler in a Chicago Machine Shop

the tumbler shaft is attached is moved forward and back, crosswise of the shaft, until the belt tracks fairly upon the keg, and is then fastened securely to the floor. By simply altering the belt, the angle of the keg may be changed from about the 30 deg. shown in the drawing to nearly 60 deg., without altering the block.

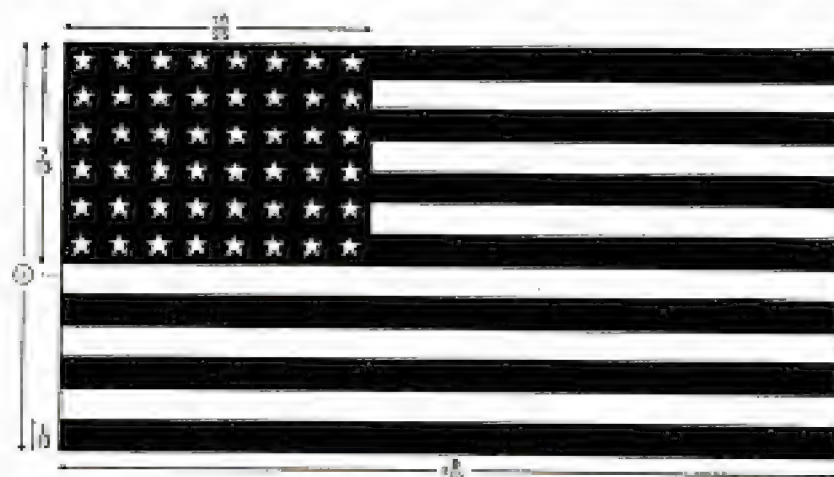
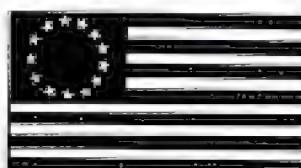
When it is desired to empty the keg, it is simply lifted from the belt and lowered to the floor or raised and swung backward.

FIXING A STANDARD FOR AMERICAN FLAGS

Because of the lack of uniformity in the proportions of the flags manufactured for the various government departments, the President has issued an order prescribing the requirements

Flags Less Than Five Feet High Must Have Only 13 Stars, Arranged in Circle

All Official Flags must be Made According to the Proportions Given Here, the "Hoist" or Height of the Flag Being the Unit One



of the standard American flag. The order was issued as the result of a report on the standardization of American flags that has been made by a board representing all the executive departments, appointed for that purpose.

The President's order prescribes that all national flags and Union Jacks manufactured for the government departments, with the exception of the colors carried by troops, and camp colors, which are provided for in the regulations of the army and navy, shall conform to the following proportions: Hoist (width) of flag, 1; fly (length) of flag, 1.9; hoist (width) of union, $\frac{7}{13}$; fly (length) of union, $\frac{76}{19}$ or $\frac{19}{25}$; width of each stripe, $\frac{1}{13}$.

The order further provides the sizes of flags manufactured or purchased for the government departments shall be limited to those with the following hoists:

No. 1, 20 ft.; 2, 19 ft. (standard); 3, 14.35 ft.; 4, 12.19 ft.; 5, 10 ft.; 6, 8.94

ft.; 7, 5.14 ft.; 8, 5 ft.; 9, 3.52 ft.; 10, 2.90 ft.; 11, 2.37 ft.; 12, 1.31 ft.

When in the manufacture of any flag under these specifications the resulting dimensions appear as fractions of an inch, such fraction shall be taken as the nearer inch. In the event of a fraction of exactly a half inch, the whole inch greater shall be adopted.

The order provides that all national flags having hoists less than 5 ft., except colors carried by troops, and the corresponding Union Jacks, shall have only 13 stars in the union, in order that the identity of the stars may be plainly distinguishable. The size of the Union Jack shall be the size of the union of the national flag with which it is flown.

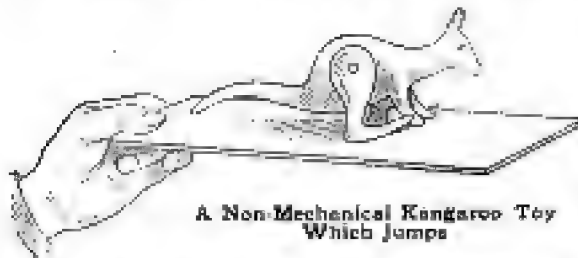
The position and size of each star for the unions of 48 and 13 stars, respectively, are also provided. In the case of the national flag which now has 48 stars, the order provides that they shall be arranged in six rows of eight stars each, with the corresponding stars in each row in a vertical line. The size of the stars in this type of flag is not determined by means of proportion but by a scale prepared by the Navy Department and supplied to the other executive departments. It prescribes that the diameter of a circle the circumference of which will intersect the five points of the star shall be 1.17 ft. in the case of the flag of type No. 2; .92 ft. in the case of flag No. 3; .83 ft. in the case of flag No. 4; .67 ft. in the case of flag No. 6; .42 ft. in the case of flag No. 7, etc.

All flags used by the government are now being made to conform to the new regulations.

JUMPING KANGAROO IS INGENIOUS TOY

A toy kangaroo which jumps when placed on a slightly inclined board, table or other surface, but which is not provided with springs or mechanical motive power of any kind, is the latest toy to please the fancy of Parisian boys and girls.

The motive power of the interesting toy is derived through the construction of the hind legs and the arrangement of the center of gravity of the body. When the toy rests on a horizontal board it is supported by the tail and the bends of the hind legs, but when the board is gently tipped the center of gravity of the body changes, the toy leans forward until only the lower part of the hind legs are resting



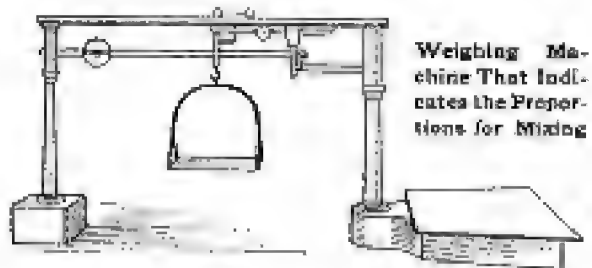
A Non-Mechanical Kangaroo Toy
Which Jumps

on the board. Then the momentum of the body causes the kangaroo to make a jump, bringing it back into its original position on the tail and bends of the hind legs again. The shock resulting from the completion of the jump throws the body forward again and the jump is repeated, and so on.

SCALE TELLS PROPORTIONS FOR MIXING

The latest means of quickly solving the problem of mixing so many parts of one substance with so many of another—as in the making of cement—is a weighing machine which calculates in percentages. A hopper containing the more bulky material is placed on a stationary platform and a bucket is set on a swinging platform. After they have been balanced on their respective steelyards by poises, a runner carries the swinging platform along the frame until an indicator points to the percentage desired. Then the hop-

per is filled and afterward the bucket on the swinging platform is supplied with the smaller ingredient of the



Weighing Machine That Indicates the Proportions for Mixing

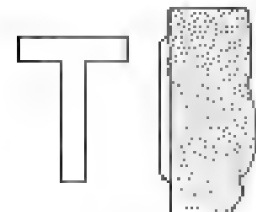
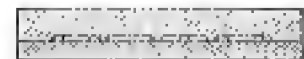
mixture until the scales balance. The machine is said to save much time and to prevent errors effectively.

SILENT WINCHES FOR STEAMSHIPS

The racking winch noises so common when cargo is being handled on board ship are slowly but surely becoming a nuisance of the past. Many steamship lines have already adopted a chain-driven noiseless winch, and a concern which has been very successful in the production of such winches is now introducing silent electric winches with lifting powers up to seven tons.

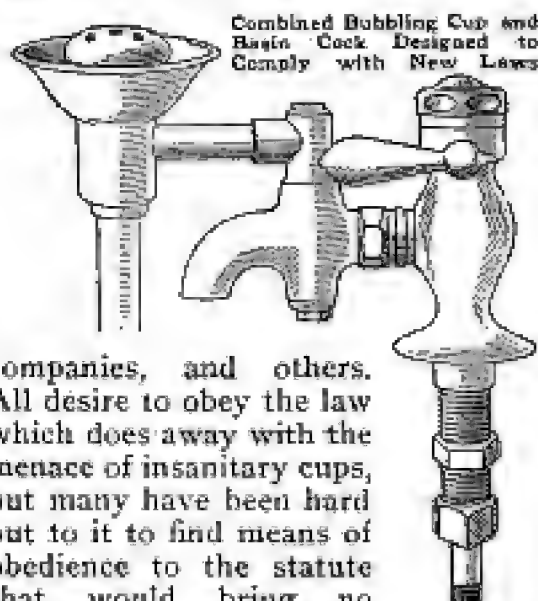
TOMBSTONES WITH GLASS LETTERING

An Indiana man has invented a process of placing glass letters upon tombstones. The letters, which have a convex exterior surface and a concave interior, are first laid on a plate of clay or wax. From this an impression is taken on a plaster-of-Paris matrix. This is planned to permit the desired portion of the letters to project. Concrete is then tamped into this matrix and the form placed on the stone.



BUBBLING CUP COMBINED WITH FAUCET

Laws compelling the abolishment of the public drinking cup have brought perplexity to building owners, railroad



companies, and others. All desire to obey the law which does away with the menace of insanitary cups, but many have been hard put to it to find means of obedience to the statute that would bring no offense to tenants, passengers, or patrons of various sorts. Some have installed paper cups, available to the thirsty person who is willing to pay one cent for the privilege, but many dry ones have resented the pay-before-you-drink proposition. Ordinary bubbling cups solved the problem only in part as they were impracticable for lavatory washing purposes. A Chicago concern now declares it has found a solution to the difficulty in the combination bubbling cup and basin cock shown in the accompanying illustration. The claims made for the new device are that it complies with the law, is self-closing and economical in the use of water, gives a solid conical bubble, a full stream from the spout, and does not interfere in any way with a person washing.

"ARGENTAL" COMPETES WITH SILVER

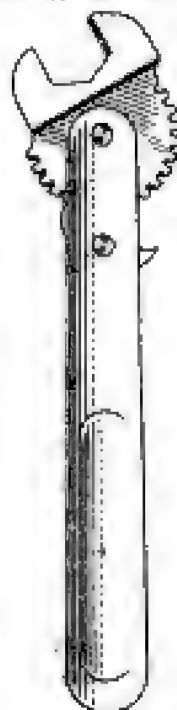
After experimentation covering several years a new metal, called "argental," has been evolved, which is composed of silver and aluminum. It is obtained by employing chemicals and

rare metals to produce the essential "affinity" between the silver and the aluminum.

In a manufacturing and industrial way the new metal may become a substitute for silver, the claim being made that the new metal is in many ways superior to the ancient white metal. Its strength is said to be many times that of silver or aluminum alone. In color it partakes more of the nature of silver than of aluminum, which will prove an advantage. The alloy is proof against deterioration from the action of ordinary acids, and it will not tarnish or oxidize by exposure to atmosphere or gases. Its specific gravity is only one-third that of silver, which will permit the manufacture of three or four times the quantity of articles from it as from an equal weight of silver. The new metal also readily lends itself to the various manufacturing methods employed in working silver and is susceptible of a high polish.

ADJUSTABLE RATCHET WRENCH

A reversible ratchet wrench, which is easily operated, is shown in the accompanying sketch. An advantage found in operating the wrench is that it may be reversed without turning the wrench over. A turn of the pawl with the thumb is all that is required to do this. The manufacturers make the claim that this wrench is adjustable to 16 different angles. Jaws or nut holders of various sizes, but, of course, interchangeable in the handle, are provided. It is possible with this wrench squarely to engage a thin nut on a flat surface, as the jaws are widened in front so as to come flush with the cheeks of the handle. The handle is offset on one side.



MAKING MUSIC WITH AN ORDINARY TYPEWRITER

A method of writing music on a typewriter or printing it with the type of an ordinary type case, and still having it sufficiently clear so that it can readily be played after a little practice, has been worked out by Clarence G. Gates of Tuscola, Ill. He has found it possible to quickly copy on a typewriter any music in this manner, and for illustration wrote a familiar melody, as shown in the accompanying illustration.

I Cannot Sing the Old Songs	
Melody	
Scale of E (E-flat.) <u>A</u> <u>B</u> <u>E</u> Two-fourths, or double measure, Eighth-notes understood.	
1	2
h = G F F. 16E = 4E D A = A G D. 16G = 4G G =	
I can-not sing the old songs I sang long years a-go, For	
h = G F F E = 4E D A = A G G F = 4E E =	
heart and voice would fail me, And foolish tears would flow, For	
h = G D E G' = G' B G E = G F F E =	
by-gone hours come o'er my heart, With each fo-ell-dar	
h = G/D/G h = G F F. 16E = 4E D A =	
strain; I can-not sing the old songs, Or	
h = A C D. 16G = 4G h = G A B h =	
dream those dreams a-gain, I can-not sing the	
h = D'/G' E. 16F = G h D. 16F = 4E E	
old songs, Or dream those dreams a - gain.	

Reproduction of Music and Words of Familiar Song.
Written on a Typewriter

The keys of a piano furnish the basis of the system, each key being represented by a fixed symbol of letters with accompanying characters. In detail, the system is as follows:

All white keys above middle C are indicated by capital letters.

All white keys below middle C are indicated by small letters.

Fourth octave above middle C: C'' D'' E'' F'' G'' A'' B'' (three-prime.)

Third octave above middle C: C'' D'' E'' F'' G'' A'' B'' (two-prime.)

Second octave above middle C: C' D' E' F' G' A' B' (prime.)

First octave above middle C: C D E F G A B

First octave below middle C: c b a g f e d

Second octave below middle C: c' b' a' g' f' e' d' (prime.)

Third octave below middle C: c'' b'' a'' g'' f'' e'' d'' (two-prime.)

Fourth octave below middle C: c''' b''' a''' g''' f''' e''' d''' (three-prime.)

C and c are the same note, middle C, and it is the only note indicated by two letters, as the primes of the letters in the first octave above and below, in-

dicating different notes, or keys. Any letter underlined, is flatted. Any letter with dot or period above it, or the mark A following it, is sharpened.

Whole notes, half notes, quarter notes, eighth notes, and sixteenth notes, are, respectively, indicated by the numbers 1, 2, 4, 8, and 16 placed before any letter. Where there are more notes of one kind in a musical composition, the particular number indicating such notes may be omitted, when such phrases, as "quarter notes understood," or "eighth notes understood," are placed at the top of the piece.

The rests are:

Whole rest — Half rest |

Quarter rest X Eighth rest *

A period after a note (letter) means the same as in ordinary music writing, that is, a half increase in the time of the note.

A tie is indicated by a plus sign, +

A slur is indicated by one or more / // placed between two or more letters.

The natural is indicated by the capital letter N.

The bar of a measure is =

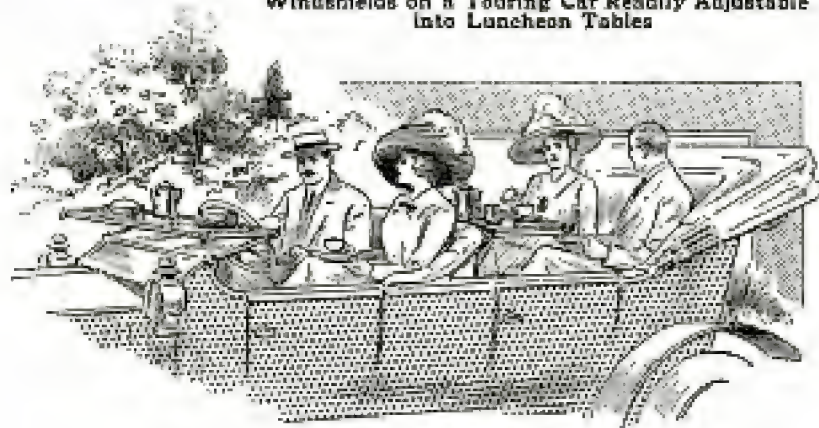
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The method is widely adaptable.

WINDSHIELDS CAN BE USED FOR TABLES

Windshields which can be used for luncheon tables on a motor touring car are now being manufactured. The

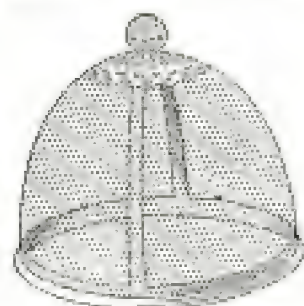
Windshields on a Touring Car Readily Adjustable
into Luncheon Tables



shields are provided for both the driver's seat and the tonneau, and are primarily intended to be so easy of adjustment for different wind conditions as to be at all times as unobtrusive as possible. This ready adjustment incidentally makes it possible to bend both shields over to a horizontal position, thus forming tables for luncheon.

SILVERED FLY SCREENS FOR DISHES

It is customary in France during the summer to protect dishes of fruit, pastry, and the like, from flies by plac-



ing bell jars of glass or metal over them. These devices, however, are rather too clumsy and inelegant to satisfy Parisian taste, and the glass and metal bells are now

giving way to bells of fine wire screen, in silver, nicked steel, etc., with elaborately ornamented tops.

These protectors are called in French "para-mouche," literally "para-fly," just as the word "parasol" means sun protector.

GENERATING PLANTS FOR OLD ELECTRIC TRUCKS

One of the large national express companies, on finding that it had a considerable number of electric motor trucks which had apparently outworn their usefulness, decided to attempt a rejuvenation, rather than scrap the machines or sell them for a song. The rejuvenation was effected by discarding the batteries altogether and installing in their place power plants consisting of a small gasoline motor direct-connected to a direct-current gener-

ator. It is claimed that the capacity of these outfits is sufficient for all the ordinary requirements of the work done by the vehicles.

In the first experiments the engine and generator were installed directly on the battery bed, the old controller was used, and the current from the generator was carried to it just as was the current from the battery, and then to the motor or motors. Later installations were more elaborate and powerful.

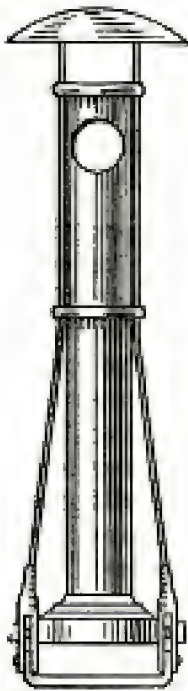
WATER BUGS THRIVE ON POSTAGE STAMPS

Postmaster-General Hitchcock is casting about for some means to curb the voracious appetite of water bugs for the gum on the backs of postage stamps. Occasionally complaints are received at the Post Office Department in Washington that stamps do not stick to envelopes. The reason almost always is that the greater part, if not all, of the gum on the backs has been eaten off by these bugs. Thus far it has been an unsolvable question how to stop this. Mr. Hitchcock has given the strictest orders that no poison of any kind tending to kill or drive away the bugs be put in the gum. He considers it better that a part of the

stamps go gumless than that any person run the risk of being poisoned from moistening the backs of stamps. Nor is any bug poison permitted to be placed near the stamps for the same reason. Of course, every effort is made to keep down the number of the pests, but it is well known that they swarm to places where there are paper, paste and mucilage, the dainties of which they are most fond.

NOZZLE THROWS STREAM AT RIGHT ANGLES

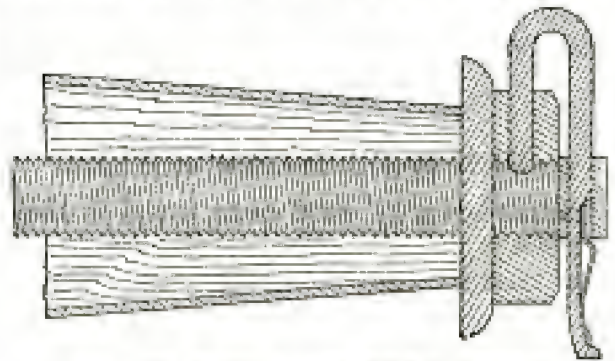
A new fire nozzle has made its appearance designed for the purpose of throwing a stream of water at a right angle or also in a cone toward rear of the discharge. At the mouth of the nozzle is a concave baffle plate held out from the discharge point a few inches by sliding rods. When this is forced down through a burning floor a stream of water can be thrown up against the ceiling below by the firemen. If the joist and lathing in the ceiling below are burning, the baffle is pulled back and closed. This throws a stream of water through a hole in the side of the nozzle at a right angle and in behind the burning joist.



NUT-LOCKING DEVICE FOR WAGON AXLE

Accidents resulting from a nut dropping off the wooden axle of a wagon may be avoided by the use of the lock nut outlined in the accompanying sketch, which shows a section of axle with the nut in place and locked. A recess drilled into the thread receives the locking pin which passes through the nut and also through the head of the bolt which carries the nut. A

small spring holds the pin in place and the latter is protected by the hub which extends beyond it. In the drawing the



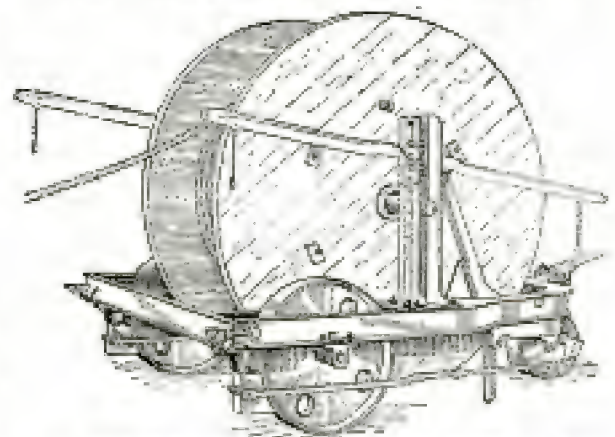
Nut Lock Which may be Readily Attached to Wooden Axle of Wagon

hub does not appear. There is nothing complicated in the device and the makers assert that an hour's work by one man is sufficient to attach a set of locks to a wagon.

THREE-WHEELED TRUCK FOR CABLE DRUMS

The drums upon which electric cables are wound are of such great size and weight that special wagons or trucks are required to transport them. These are generally four-wheeled steel trucks with a low floor and two inclined channel beams at the ends over which the drums can be pushed, but a new type of truck for such purposes has recently been turned out by a German firm.

This truck comprises a heavy U-



An Ingenious Three-Wheeled Truck Designed for the Transportation of Cable Drums

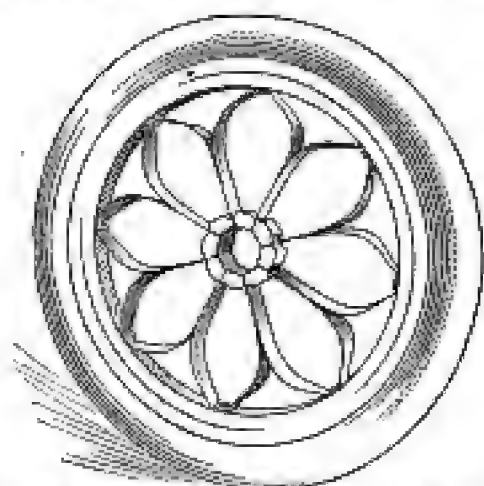
shaped frame, the open end of which is provided with a removable crossbar, while, at either side, rises a steel

post provided with a slot in which the spindle of the drum may be moved up and down. The frame is carried on three wheels. When a drum is to be transported by this truck, the cross-

bar is removed and the truck is pushed backward until the drum is inclosed by it, the bar is replaced and bolted, and the drum is raised from the ground by operating the levers.

STEEL MOTOR-CAR WHEEL

Superiority of steel over wood is the "talking point" most emphasized by the manufacturers of the steel auto-



Steel Wheel Showing Construction and Facility of Replacing Parts

mobile wheel shown in the accompanying illustration. Strength of from two to five times that of a wooden wheel of the same weight is claimed for the steel wheel, and it is so simple in construction that it may be dismounted and any of the parts easily replaced. The natural spring of the steel is an advantage as it imparts some degree of resiliency, making the new-style wheel particularly useful on electric vehicles which ordinarily are equipped with solid or cushion tires.

CITY GARBAGE UTILIZED IN STREET LIGHTING

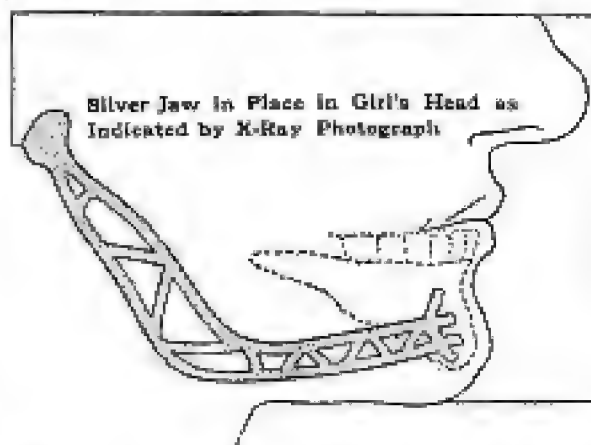
The garbage and other refuse of Minneapolis, Minn., is being utilized to generate current for 200 street-illumination arc lamps, the health department, which collects the garbage and refuse and operates the incinerator, being paid \$5 per street lamp less than the city pays the lighting company.

Most of the garbage gathered from

Minneapolis homes is drained by the householders, at the request of the health department, then wrapped up in paper and placed in covered cans. Combustible trade refuse is brought to the furnace at private expense. The draining and wrapping of the garbage increases its combustible value to a considerable extent, as well as helping keep the cans clean and making once-a-week collection in the residence districts satisfactory even in the summer time.

GIRL HAS A SILVER "JAWBONE"

That a silver "jawbone" is practical and efficient has been proven after a thorough test in the case of a patient of a Chicago physician. A sarcoma, a form of cancer, had attacked the lower jaw in a girl of eleven, destroying a portion of it and threatening death in a short time. The surgeon removed half of the jawbone on the diseased side and inserted a silver framework shaped somewhat like the bone, hav-



ing a large knob similar to the joint end of the natural bone, for articulation with the bones of the skull. The other end of the frame was inserted for one-third of an inch into the healthy

portion of the jawbone and then the soft tissues were sutured around the framework.

After some little trouble perfect healing had taken place, and the patient, now, after a test long enough to satisfy the surgeons, has a serviceable lower jaw, half natural and half silver, with scarcely any external evidence of her unusual possession except a slight lack of symmetry in the two sides of the face. A bridge even supplies the missing natural teeth on that side. The illustration, reproduced from the Journal of the American Medical Association, shows the framework in place, as revealed by the X-ray.

FIGHTS LOCUST PLAGUE WITH EPIDEMIC

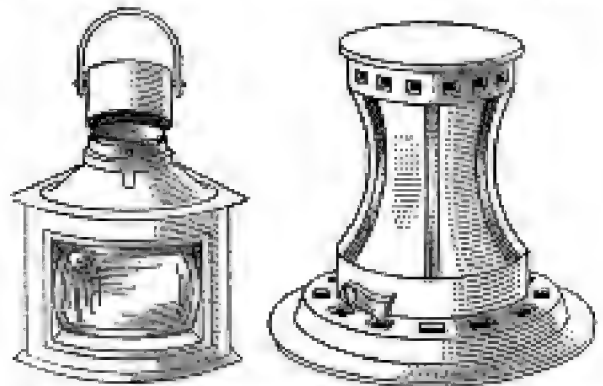
Great success has been met with by M. Felix d'Herelle, a young French physician, in fighting the locust plague in Argentina. During a visit to Mexico two years ago, the physician observed an epidemic among the locusts there and, after prolonged research, succeeded in discovering the bacillus of the disease. He decided that the best means of combating the insect would be to spread this disease among them, and the Argentine government invited him to make a practical test of the idea.

His first experiments were successful. A column of locusts kept between barriers for observation purposes, were exterminated six days after they had eaten grass sprinkled with a preparation containing cultures of the bacillus. Further tests showed that the infected insects spread the disease over great distances in a very short time, dead locusts being found 30 miles from the infected fields. Forty days after the test, locusts bearing the characteristic marks of the epidemic were found 250 miles from the infected area.

The French physician declares that his preparation is harmful only to the locust, the cattle and flocks grazing on fields sprinkled with it suffering no ill effects.

USEFUL YACHTING SOUVENIRS

Yachting souvenirs and novelties which have a practical as well as ornamental value, comprising compass-



Silver Inkstands and Cigar Lighters Made in the Shapes of Side Lights and Capstans

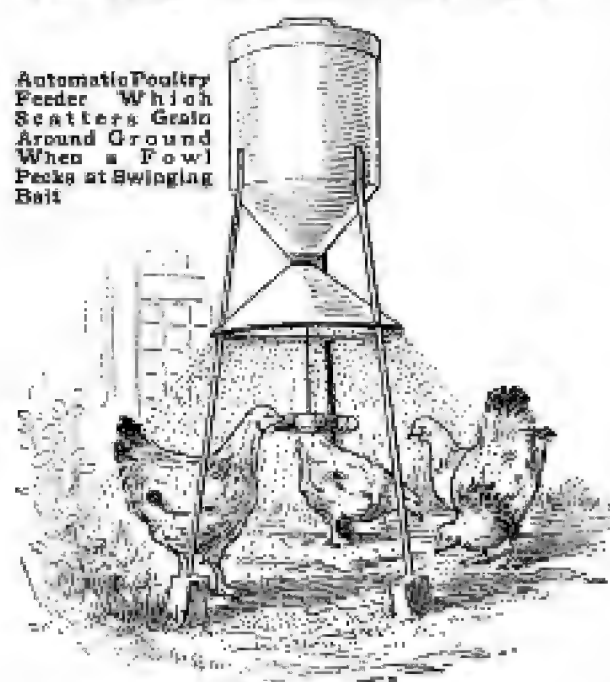
sundial paperweights, bollard inkstands, capstan inkstands and cigar lighters, ventilator pepper boxes, and the like, made their appearance during the yachting season. Two of the novelties are shown in the illustrations, one being a solid-silver yacht side light made both as an inkstand and as a cigar lighter, and a solid-silver capstan cigar lighter. The capstan is also made up in the form of an inkstand and pepper box.

PECKING AT BAIT BRINGS SHOWER OF GRAIN

A newly invented type of automatic poultry feeder depends upon the same principle that is used in baiting a trap, for this feeder has a bait that is pecked by the hungry fowls and, in response, the machine lets a shower of grain fall on the ground, which they devour.

The machine consists of a galvanized-iron supply fount filled with grain and a revolving toothed wheel at the base of it. This wheel is mounted on very delicate bearings which admit of its movement at the slightest touch. Attached to the wheel is a shaft which supports the bait. The bait consists of a hollow tube of wire netting containing wheat. The fowls see the wheat through the netting and peck at it, causing the toothed wheel to re-

volve and throw out grain from the top supply fount which falls on the lower metal cone and is scattered over

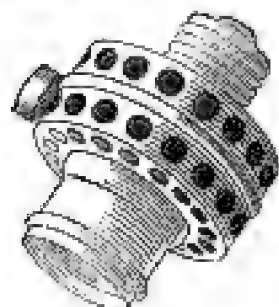


the ground almost as efficiently as by hand. This prevents the fowls from gorging themselves.

After the feeder has been in use for a time there is no great rush by the fowls to peck the bait as one would imagine. Some fowls, the "wise" ones, wait around in a circle where the grain will be thrown and the one which pecks the grain usually gets very little of it.

SOCKET REGULATOR FOR INCANDESCENT LAMP

A new form of regulator for incandescent electric lamps is shown in the illustration. It is a small compact attachment to be



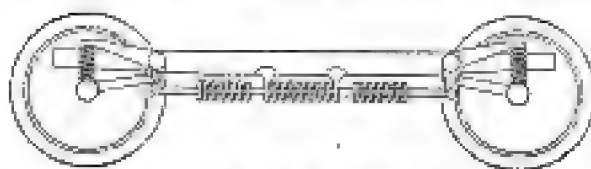
inserted between the lamp and the socket and the quantity of light is regulated by means of a small screw. The feature of the device is a wire resistance wound upon a hobbin across

which a contact is made by a brass spring on the end of the screw shaft.

The resistance is contained within a ventilated brass casing and the device is made of heavy stampings in order to give it the necessary rigidity. The regulator is manufactured in several assortments of brasses and bronzes to match different kinds of electrical fixtures.

NEW SPRING SUSPENSION FOR MOTOR CARS

An automobile spring-suspension system of a radical type is being demonstrated by a West Melbourne (Australia) inventor. Not only is the arrangement of springs and levers somewhat startling, but the results of the tests made have been such as to call forth favorable comment from experts. As shown in the accompanying illustration there is an entire absence of leaf springs in the system, all the springs being of the spiral type and all working under compression. By virtue of the lever action, which for all its simple appearance is decidedly



Motor-Car Spring-Suspension System

complex, the weight of the car is divided among the various springs. Not only is the downward tendency of the body, as when the car wheels drop into a hole, checked by the spring arrangement, but the rebound is caught, cushioned and absorbed. The system was recently tested out on a specially built car equipped with solid-rubber tires, and the value of the novel equipment demonstrated under unfavorable conditions.

The balloon "Uncle Sam" made a new record for elimination races July 27 and 28 in preparation for the international contest by drifting from Kansas City, Mo., to Manassas, Va., a distance of 925 miles in 36 hours.

REMARKABLE BAGGAGE-SMASHING TEST

A trunk which is expected to thoroughly discourage baggage smashers was given a rather unusual test recently in Los Angeles. It was hoisted to the roof of a department store in the course of erection and dropped from a crane to an excavation below, a distance of 215 ft. The 68-lb. trunk hit the ground with great force, but, according to the claims made, was hardly dented, its condition being so good that it could be used for a trip around the world.

The trunk is constructed of thin veneers of hard wood with the grain running in various directions, this resulting in a very tough and light piece of luggage.

AN INTERLOCKING PACKING HOOK

A special hook said to be particularly effective in removing greased packing from around shafts and bearings, such, for instance, as out of the grease boxes on the axles of railroad rolling stock, is here shown. It is made of soft steel with hardened points, and by a slight twist and the slipping



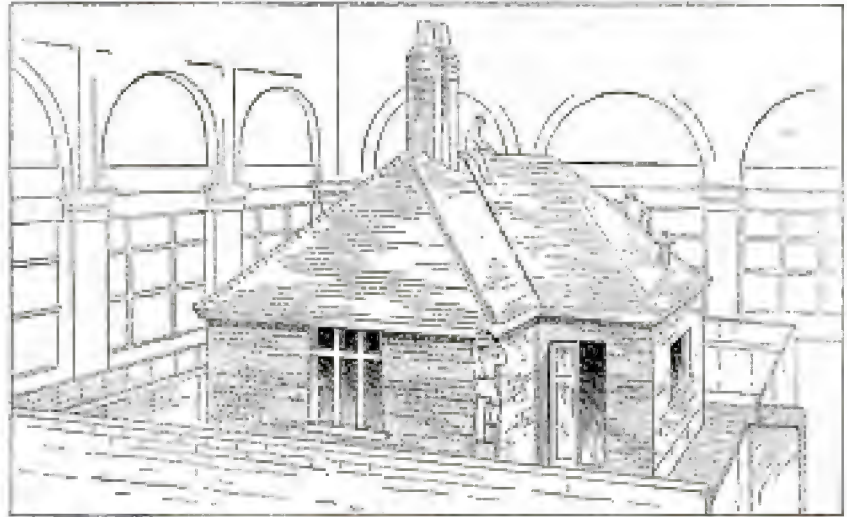
Simple Device for Readily Removing Greased Packing

of the ferrule along the shank, the points form a loop through the packing, thus affording a secure hold in pulling out the packing.

¶The Navy Department of the United States has invited manufacturers to submit plans for the hydro-aeroplanes it is proposed to make part of the equipment of each battleship.

BRICK HOUSE INSIDE SCHOOL BUILDING

A complete brick house inside the big hall of a schoolroom has been erected by a dozen students of the London



House Built by Students Inside a School

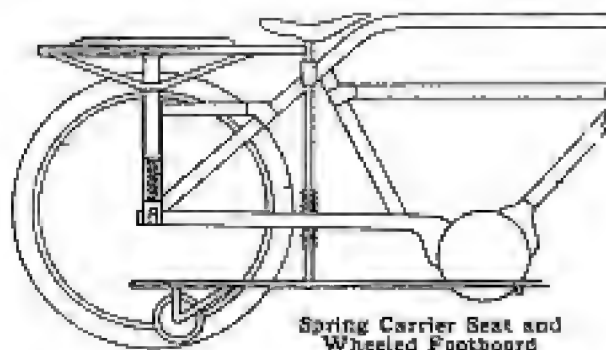
County Council School of Building. All the work on the structure was done by students, and it is the intention to remove the house outside and then use it for a students' club house. It is in the style of a Tudor cottage, with red-tiled roof. There is a breakfast room, dining room, bedroom and bathroom. Other students of the school are now making furniture for the house.

PUMPING WATER INTO CANAL

Water is supplied for the Canal d'Orleans in France by pumping it from the Loire River by means of what is termed a "canal regulator." The canal connects the Loire with the Loring Canal through which the lesser river finds outlet into the Seine. It formerly was fed by a number of small streams and 13 reservoirs, but the water derived from these sources was found inadequate for the traffic of the canal. The "regulator" lifts the water from the Loire River by means of electric pumps, operated by power obtained from a central station established for that purpose.

SPRING SEATS FOR MOTORCYCLES

An English inventor has evolved the spring carrier seats and footboard attachment for motorcycles shown in



the accompanying illustration. The side wheels, he declares, would prove a boon to learners and even to experienced riders who become nervous in heavy traffic. The devices are also recommended for the use of women riders. In the event of a skid the trailer side wheels would be brought into action.

DETERMINING CARBON IN STEEL

An improved "combustion train," as is called the apparatus for determining the percentage of carbon in steel, has recently been perfected by a Philadelphia engineer. The steel to be tested is placed in the heating chamber of an electric furnace into which pure oxygen has been introduced. The car-

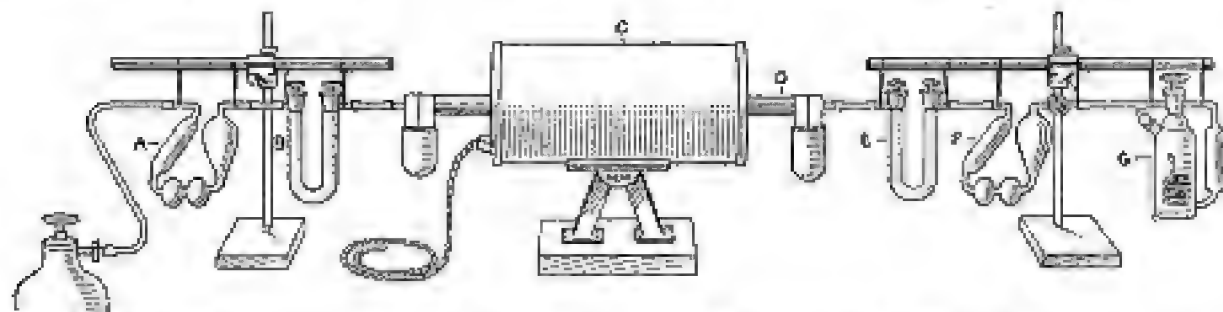
bon dioxide. The carbon-dioxide gas is then dried and purified in a series of glass tubes and bulbs, and finally passes into a collecting bottle where its weight is easily computed.

The advantage of this combustion train over other existing types is found in a double bulb which contains potash in certain form, with which the carbonic acid combines, making it possible to determine the amount of carbon by the increase in weight of the bulb. In this device, the bulb has so many improvements for controlling, handling, and increasing accuracy that the chemist may make more than 100 combustions without refilling the bulb.

THE NAMING OF LOCOMOTIVES

An amusing story having to do with the naming of locomotives was recently published in the "Berliner Tageblatt." At the meeting of the board of directors of a small local railroad in Germany the question of naming three new locomotives was discussed.

One director who was more or less of a joker proposed that the locomotives be named "Isolani," "Luther," and "Galileo," giving as his reason three famous sayings of these men. General Isolani (in Schiller's drama "Wallenstein") says "They are late to come, yet they arrive." Before the Reichstag at Worms Luther said "Here I stand and cannot otherwise." Galileo, after having retracted his, at the



Showing Electric Apparatus for Determination of Carbon in Steel: A and B, Purifying Tubes for Oxygen; C, Electric Combustion Chamber; D, Delivery Tube; E, Tube for Removing Impurities from Carbon Dioxide; F, Bulb for Removing Moisture from Carbon Dioxide; G, Double Potash Bulb for Absorbing Carbon Dioxide

bon as well as the steel are thus burned or oxidized, the carbon combining with the pure oxygen to form

time, heretic belief that the earth moved around the sun, said, "And yet she moves."

EXAMINING THE BODY WITH SEARCHLIGHTS

Inventive genius has now made it possible to look into nearly all the hollow organs of the body during life, to extract foreign bodies which have lodged there accidentally, or to explore and treat diseased conditions. Children, frequently, and grown people, occasionally, swallow or suck into the windpipe various objects, which lodge in the esophagus, or in the bronchial tubes.

have lodged in the esophagus, the passage to the stomach.

An improvement on this instrument enables the surgeon, through conveniently arranged mirrors and a small electric lamp at the end, to have a view of the interior of the stomach, and he may study the condition of the lining of that organ. The inside of the bladder may be explored in the same way.

The X-ray is



The bronchoscope is a tube with a handle and mirror by means of which the surgeon can look down into the bronchial tubes and locate such foreign bodies, and by the aid of other appliances they may be grasped and removed. A similar instrument is used for locating objects which may

also used for locating such foreign objects in the bronchial tubes or esophagus, and they may then be removed by forceps or other extractors under the guidance of the eye.

The tube for washing out the stomach has been used for a long time, but by means of a longer tube the

stomach may be passed and the duodenum, the first portion of the intestine, may also be explored. The radiograph shows this instrument with a metal ball on the end far down in the intestine. It is used to ascertain whether the passage from the stomach is free or constricted by disease, as sometimes happens. The same instrument is also used for feeding infants

whose stomachs will retain no food. A small bucket on the end of a thread may also be passed through the tube and into the bowel, and the secretions of that portion of the digestive tube may be collected and withdrawn for examination.

By the use of these ingenious instruments much suffering is prevented, and many lives are saved.

HYDRO-AEROPLANE MODEL OF UNUSUAL SIZE

A model hydro-aeroplane which appears to be large enough for a regular aeroplane motor, but which is driven

BORING CYLINDERS WITH AUTOMOBILE POWER

An unusual application of motor-car power in an emergency is related from Mississippi. A machine company at

Jackson was recently called on to bore out the hydraulic water cylinders for a cotton compress at Yazoo City. The cylinders were 27 in. in diameter and made of cast steel. In order to do the work it became necessary to obtain power by some special means, as neither steam nor electric power were available at the cotton plant. The problem was solved by using a steam-power motor car. The engine was connected up with the boring bar by means of sprockets and chain. The time required to bore out the cylinders and packing grooves was 101 hours.



Courtesy Aircraft

An Exceptionally Large Hydro-Aeroplane Model, Driven by Rubber Bands, Used in Germany for Testing Various Types of Planes

for a short distance by two exceptionally powerful rubber-band motors, is being used on one of the German rivers for testing the efficiency and stability of various kinds and shapes of planes. The little hydro-aeroplane consists of a small one-passenger boat fitted with planes. The rubber bands are stretched from end to end of the craft and are twisted up in the same manner as the small bands of a toy aeroplane.

Chicago and Philadelphia are designated as the "laboratories and workshops" of America by a Frenchman who has recently visited the United States and spent two whole weeks "investigating" its customs and resources. He also referred to New York as the "hotel and restaurant" and Washington as the "salon" of the nation.

THE WONDERS OF LIGHT

VIII—What Eye Hath Not Seen

WE feel infinite compassion for those unfortunates who are born into the world blind or deaf or dumb. We think of all that they must necessarily miss; the gorgeous colors of sunrise and sunset; the rich, emerald greens of a spring landscape; the ruby and gold of a northern autumn. When we listen to the sublime music wrought by a master touch on violin or piano, or sit entranced as we hear the voices of those who lead us from the shadowy vales of everyday life to the mountain tops of happiness with their exquisite harmonies of deathless song, we sorrow for the sad lot of those who can never appreciate nor understand in the slightest degree these delights of sense perception.

They are like barren, isolated islands in a wide, wide sea, and, so far as existence is concerned, it were better, mayhap, had they never been born. There has been but one Helen Keller, but one Laura Bridgman. All the others have not as much enjoyment as the lower forms of life that are en-

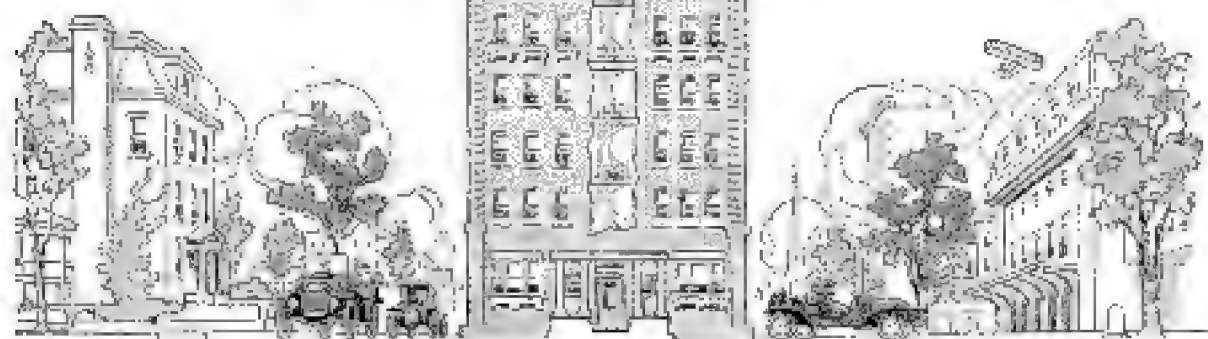
By
J. GORDON OGDEN, Ph. D.

dowed with all their natural senses.

And yet we are not much better off with our splendid gifts of sight and hearing, if we consider all the wonderful phenomena about us of which we know the existence, but cannot perceive by any of our senses. If an inhabitant of some other planet where sense development has reached its highest perfection, were to visit this world of ours, he might regard us in very much the same way as we regard the sense-bound Helen Keller.

We hear by means of vibrations; we see by vibrations; we are warmed by them. The mystical quiverings and pulsations that travel through the ether are only means by which we perceive the glories of color and form, and only the smallest fraction of these vibrations are we capable of interpreting.

Suppose we are sitting in a room that is perfectly dark, where a steel bar is so suspended that it can vibrate without any friction, and with as great velocity as we desire to give it. Let us



The Mysterious Rooms Which are Locked to Human Senses. Dr. Ogden Describes the Vibrations of All Speeds, and These may be Compared to the Various Floors of a Skyscraper Apartment House, in Which the Only Apartments Open to Human Perception are the Ones Called Sound, Heat and Light, While the Intermediate Apartments are Those to Which Science is Striving to Gain Entrance.

start the bar spinning on its axis. We hear nothing, see nothing, until the bar beats the air 16 times in a second; then we become conscious of a deep, humming sound, the lowest that may be heard by human ears. We increase the rate to 17 vibrations and the pitch rises; then on to 32, when we hear the octave of the first sound; then on and on, doubling the rate each time, passing through the various octaves, and the pitch is ever rising. Finally when it is vibrating at the rate of about 40,000 per second, the sound is a shrill, ear-splitting shriek, so piercing and so high-pitched, that it actually pains us to hear it. Then increase the rate a few vibrations. The sound ceases absolutely, although the bar is still vibrating. We have passed beyond the limits of human perception of sound waves. Then speed up the bar; fifty thousand, sixty thousand, a hundred thousand, five hundred thousand, a million vibrations per second. Still no perception of anything that is coming from the bar. Faster and faster! Ten million, a hundred million, a billion! Still no perception of the frightful beating of ether waves, through any of our senses. An almost incalculable number of ether waves of different lengths have hammered upon us, like the waves of a mighty ocean against a rock cliff, but they have not affected us, so far as we know, in the slightest degree.

Up into the trillions, then, runs this ether-beating bar, and then we begin to perceive that something out of the ordinary is happening. From the bar there comes to us an agreeable warmth; it is now sending us vibrations which we interpret as heat. Then faster and still faster whirls the bar of steel, and as soon as it attains the rate of about 400 trillions per second, the bar begins to glow with a dull, red light. Increase the rate to 440 trillions, and the red fades into orange. As we increase the speed, the colors change successively to yellow, green, blue, and finally, at about twice the rate at which the red was produced, the bar becomes beautifully vio-

let in color. Then if we still persist in greater speed, the colors die away, and the bar whirls on in absolute darkness, giving vibrations of still shorter wave lengths, but which we are unable to perceive with any of our sense organs. There can hardly be any doubt that all these different rates of vibration mean something, if we had the necessary sense acuteness to perceive them. Yet we are as blind and deaf to them as Helen Keller and all other like unfortunates are to ordinary light and sound.

Suppose that this earth of ours, whose area in round numbers is about 197,000,000 square miles, had no civilized human inhabitants except on a plot of ground, 10 miles square, in the center of a vast prairie, and that we, the dwellers on this fair-sized farm, had never ventured beyond this area. Suppose that nothing whatever was known of the balance of the globe. We could not claim to know much of the earth on which we dwell, and if we attempted to write a detailed description of the earth from what we perceived in our limited area, we would necessarily have to omit the most wonderful things on this planet of ours. We would know nothing of mighty oceans, of stupendous mountain ranges, broad rivers, immense canyons, beautiful lakes, roaring cataracts, cloud-crested volcanoes, the strange peoples, and the myriad forms of life that exist elsewhere on this globe. We would know only the comparatively few things that come within the range of one who is limited to such a "cabined, cribbed and confined" area.

And so is it with our sense perception. Out of all the innumerable trillions and quadrillions of vibrations that beat upon us in our everyday lives, we perceive just a few quiverings of the ether, and interpret them as heat or light, and all the others that may be as varied and as different in their effects, as light is different from heat, and heat from sound, are absolutely unperceived by us. Truly we are not so far from being Helen Kellers after all!

As Tyndall has said: "The domain of the senses in nature is almost infinitely small in comparison with the vast region accessible to thought which lies beyond them. From a few observations of a comet when it comes within range of his telescope, an astronomer can calculate its path in regions which no telescope can reach; and in like manner, by means of data furnished in the narrow world of the senses, we make ourselves at home in other and wider worlds, which are traversed by the intellect alone."

We have all gloried in the wonderful blending of colors as seen when the sun is setting in conditions favorable for a chromatic display; but if our eyes were sensitive to the vibrations above and below the spectrum limits, what marvels would they reveal, and what unspeakable harmonies of radiance would thrill our very souls! Were our eyes sensitive to "heat" waves, we could see perfectly well in an absolutely "dark" room, if there were a hot stove in the room. We could use thin, hard rubber windows and see through them as we see through transparent glass. We could use spectacles and telescopes whose lenses were of thin rubber!

Suppose we could look deeply into matter and see the wonderful dance of atoms and electrons which go to make up "matter," and perceive these infinitely small particles, if particles they are, moving with a velocity of 60,000 miles per second. Every wire carrying a current of electricity would be a source of delight to us; we could see

the mysterious "lines of force" of Faraday whirling around in a dizzy dance about the poles of a common magnet.

If, on the other hand, we could go to the other extreme of the spectrum and see the tiny waves, less than $1/64,000$ of an inch in length, that are known as the ultraviolet, how wonderful it would be! Although these ultraviolet waves do not stimulate our optic nerves, they will affect a photographic plate. Figure

2 is a picture of a man taken in full sunlight by means of these wonderful rays. The lens used was made of pure quartz, as glass is opaque to these smaller ether waves. The lens was also covered with a thin film of pure silver, which is opaque to ordinary sunlight but quite transparent to the ultraviolet radiations.

These tiny violet waves have a very important function in our vital economy. They are the chemists of the invisible world and are the real agents by which a plant is enabled to transmute water and the poisonous carbon-dioxide gas into valuable foods, such as sugar and starch. They are also used by the physician in the treatment of cancer.

Many forms of skin disease readily succumb to their action. They are like tiny little hammers which break down many chemical compounds, such as the salts of silver when emulsified with collodion or other organic substance. This is the basis of modern photography as will be explained in a succeeding chapter. They hammer upon certain of the chemical compounds in the skin, and it is not the seashore nor the



Courtesy Illus. London News

Fig. 1—Photograph Taken under Usual Conditions, and Showing the Man's Shadow

Fig. 2—Photograph Taken by Ultraviolet Rays at Same Time as Fig. 1, in Which Shadow is Not Present

wind, but the ultraviolet rays that bring about the "beautiful coat of tan" so much sought for in these days of athletic trend.

Figure 3 is a photograph made by



Courtesy Hils. London News

Fig. 3—Photograph Made in Full Sunlight by the Invisible Infra-Red Rays

means of the infra-red rays,—waves that are too long to excite vision. The lens was screened by a dense cobalt glass, and also by a filter made of a strong solution of bichromate of potassium, which combination eliminates the visible light, and allows only the infra-red rays to reach the sensitized plate. These remarkable photographs taken by means of either the ultraviolet or the infra-red waves, show us how the world would appear were our vision limited to these rates of vibration.

Electricity, heat, and light are forms of the same kind of ether wave motion. They differ only in the length of waves. The shortest light waves are about $1/64,000$ of an inch. The shortest heat waves are about $1/30,000$ of an inch, known as "dark" heat waves, the longer ones, a few thousandths of an inch in length are "radiant heat," while electrical waves vary in length from the tenth of an inch to over one mile. Marconi when he sent his first signal across the Atlantic, used waves about 600 ft. in length, while the Calcutta physician, Jagodis Chunder Bose,

the first man to send a wireless message, used waves that were only one-tenth of an inch long.

Wonderful indeed are these ether waves, whether they come to us from the stars shining in the far firmament of the heavens; from the electric wires of dynamo, telegraph, or telephone, that crisscross our cities in every direction; from the motors whirring under the floor of street cars; from the trolley wire overhead, or from the fireplaces in our comfortable homes. All of them send forth their marvelous quiverings that beat upon us, are reflected from our bodies, or else riddle us through and through, as though we were

naught but thin, transparent air. And what a wonderful thing it would be were we able to perceive all that is happening on our crowded streets, filled with the intricate tangles of these mysterious vibrations, that come to us from every direction, and with every conceivable rate of speed. How do they affect us, and will there be any permanent change brought about in the intellectual or physical make up of our descendants, produced by the incessant hammering of these tiny little ether projectiles.

All of these waves—light, heat, and electric—travel at the same enormous velocity of over 186,000 miles per second. Light waves pass readily through glass, heat waves through rubber, and electric waves seem to have no trouble in passing through mountains and houses, and are stopped only by metal. The ultraviolet waves, as we have seen, pass with ease through solid silver.

Light waves have a remarkable effect upon the element known as selenium. This substance is a good conductor of electricity, but its conductivity increases when light is thrown upon

it, and decreases when the light waves are withheld. Hence it is used in the construction of an apparatus known as a photophone. One form consists of a thin mirror of silvered mica which receives sound vibrations, and upon which light waves fall at the same time. This light is reflected to a concave mirror at a distance, and is brought to a focus upon a selenium cell connected with a telephone that reproduces the spoken word. Light may therefore be used as a medium for the transfer of oral messages.

It is possible to render visible some of the invisible light waves known as the ultraviolet. These waves may be likened to race horses that travel so fast that they are invisible. If we handicap these horses so that they are compelled to travel more slowly, they come within the range of our vision. Ultraviolet light, otherwise absolutely invisible, when passed through a solution of horse-chestnut bark, or of quinine, has its wave length increased, and becomes visible. This phenomenon of light is known as fluorescence. The delicate blue color of coal oil is due to this principle. It may also be

observed on the surface of certain minerals, such as fluorspar, and the yellowish-green surface color of glass colored with the oxide of uranium is a phenomenon that is also due to fluorescence.

Light waves that are just a trifle too long to be visible, may be transformed into more rapid ones. If a beam of light is passed through a solution of iodine in carbon bisulphide, the visible rays are quenched, but the long, infra-red rays pass on. If these rays are focused by means of a lens upon a strip of platinum foil, the platinum will become luminous, and the light therefrom gives a continuous spectrum when examined with a spectroscope. This shortening of wave lengths is known as calorescence.

And yet, all of these wonderful ultraviolet and infra-red rays are only a few of the waves that some day may be known to us. What other waves are in the vast gap between sound, electricity, and heat, between heat and light, and in the interminable abyss beyond light? Mayhap we shall know more about them fifty years, even ten years, from now. Who knows?

CODY'S "FAMILY-BUILT" AEROPLANE

The monoplane shown in the accompanying illustration is the product of the Cody family in England. It has a 120-hp. engine and the inventor makes the claim that he has used few, if any, of the ideas of other designers in the

construction of the machine. With the exception of one assistant, the entire machine was built by Mr. Cody and members of his family.

In the illustration Mr. Cody is shown making a test of the resiliency of his newly constructed chassis. The

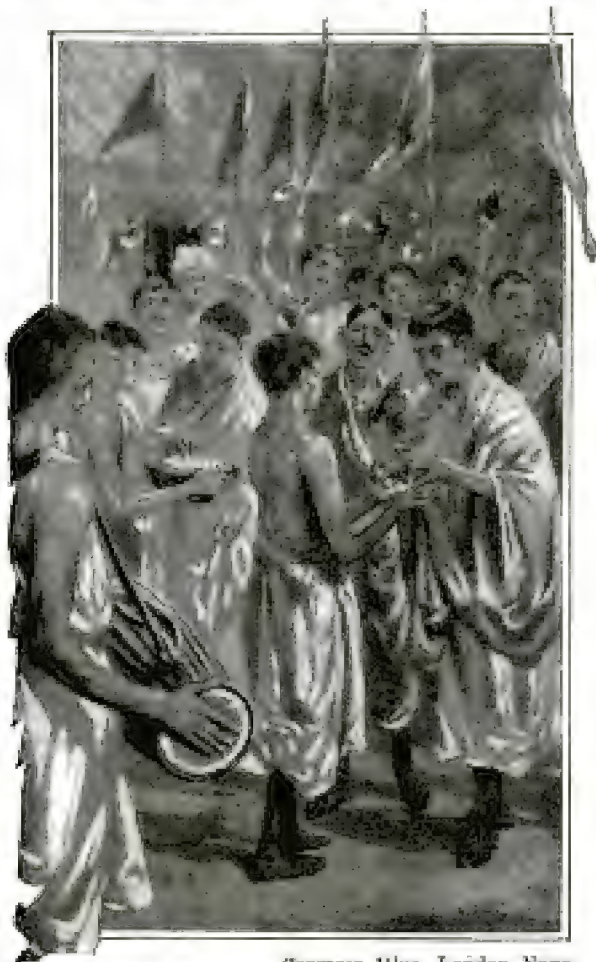


Inventor, Weighing 224 Pounds, Tests Spring of Framework by Walking on Aeroplane's Wings

test should prove an adequate one as Mr. Cody is said to weigh 224 lb., or 16 stone, in the English phrase. The monoplane is designed as a military type and in carrying out this idea the maker leaves it without protection in all sorts of weather. One of the features of "The Dart," as the inventor has named his machine, is the engine which, although of large size, is operated with comparatively little noise. It is said that at a distance of half a mile it is almost inaudible.

HINDUS GAMBLLED OVER NEW YORK FIGURES

New York cotton-market quotations have been the basis of a peculiar form of betting in Calcutta, India, and the



Courtesy Illus. London News
Hindu Thanksgiving for Suppression of Gambling
over New York Cotton-Market Figures

efforts of the police to stop the craze have only recently succeeded. The Hindus themselves appreciated the

serious nature of the betting craze, which flourished among the very poor and resulted in many cases of insanity, so that when the police finally suppressed this gambling, a Hindu ceremony of thanksgiving was held. The blessings of the goddess Kali were invoked for the police, and a singing party distributed sweets, made of sugar and treacle, along the streets to the accompaniment of cymbals and drums, as shown in the illustration. The gambling method which was stopped was simply to bet on the total sum of the five quotations on cotton which were daily cabled from the New York market.

THRESHING WHEAT AS IT STANDS IN FIELD

When harvest arrives in Kansas it is time for a progressive farmer to get his small grain into sacks with all possible speed or be ready to put some ugly figures on the wrong side of the ledger. Big crops require many farm hands at harvest time and these are getting scarcer every year. This situation has given a young Kansan an idea which is getting considerable attention among the wheat growers. He has invented a machine to thresh the grain as it stands in the field. He claims that one man and four horses can do the work of a whole threshing crew.

This thresher is set on a truck in such a manner that it can be raised and lowered at will. A 25-hp. gas engine operates the mechanism. As the thresher moves along, heads of grain are blown against a cylinder set with 4-in. teeth. This rotating cylinder lops off the heads and tosses them back into a cavity. From this the grain is carried up on a worm to the rethreshing cylinder which rotates at greatly increased speed. Having been threshed the grain is carried up a perpendicular tube called a cleaner and passes through a strong current of air from a blower. Here all chaff and dust is finally disposed of, and the



Threshing Wheat Standing in the Field

grain falls through another chute into the sack or wagon.

With the exception of the truck and the gas engine, the machine contains but eight moving parts and all these rotate. The current from the blower is said to be strong enough to pick up

fallen grain in the field, but a finger is provided for this purpose if desired. After the threshing the farmer needs not remove the straw before plowing. He starts his plows to work when he is ready and plows the standing straw under.

EMERGENCY STEERING GEAR FOR AUTOMOBILES

An emergency steering gear for automobiles, recently patented, is about to be placed on the market. The device is a double steering gear, each unit of which operates independently of the other. The main gear operates a knuckle joint, while the emergency device operates directly on the wheels of the machine, a steering post being fastened directly beneath the steering wheel and operating on a worm screw connecting with rods. The rods run to the forward wheels on which are bolted collars set in a flange bolted to the wheels. The flanges are so constructed that the collar rests in them and runs on ball bearings.

Should the main steering gear break, the rods connecting the two front wheels hold them from swerving and steer as if nothing had happened. If one of the rods connecting the two

front wheels breaks, the other does the work. If a nut comes off one of the wheels, the flange and collars prevent the wheel from coming off.

BEGGING "POODLE" FORMED IN SMOKE

The illustration is the reproduction of an interesting photograph taken two or three minutes after the explosion of



a powder mill located about five miles from Wilmington, Delaware. When the negative of the camera exposure was developed, the photographer discovered that the smoke rising from the explosion had so shaped itself as to suggest a small poodle dog reared on its hind legs in the act of begging.



Cars Lined Up on the Wooden Starting Trays, Waiting for the Signal

STARTING TRAYS FOR BEACH AUTO RACING

Automobile racing on the hard sands of the seashore is as popular in England as on the beach at Daytona and Ormond, Florida. The most popular beach racing in England is at Saltburn, on the Yorkshire coast, under the auspices of the Yorkshire Automobile Club, and high speeds are attained.

One of the interesting minor features of these meets are the wooden trays from which the automobiles start. These are not much longer than the cars themselves, but they provide a base into which the wheels of the machines will not sink while waiting for the starting signal, and thus assure a clean get-away.

FIRST FLAG OF FRENCH AERONAUTICAL CORPS

The French Aeronautical Corps, which comprises operators of aeroplanes, airships, and ordinary balloons, received



its official standard at a recent military review, but it already had an unofficial standard presented to it by a woman's aviation society of France. This standard is of silk, embroidered in gold, and bears a winged anchor and a laurel wreath in the center. The name "Fleurus" commemorates the battle at that place in 1794, at which

a captive balloon was used in war for the first time. The legends "Extreme Orient" and "Maroc" refer to the use of the aeroplane in the far east and in Morocco. The name of the woman's aviation society is "Stella."

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ELECTRICALLY DRIVEN TUG FOR INDIA

An electrically propelled tug, 59 ft. in length, was recently constructed in Rotterdam for service in India. A high-speed engine drives a generator which furnishes current for a 70-kw. direct-current motor on the propeller shaft. This motor drives the shaft at 232 revolutions per minute. The motor can be reversed from full power ahead to full power astern in from two to three seconds, as against the 10 to 15 seconds required for a good steam engine.

STUDYING A PATIENT'S RESISTANCE

Elements in the individual and family history of a patient likely to aid a surgeon in determining what degree of physical resistance might be expected from him when about to undergo an operation of the type defined as "borderland," were considered at some length by Dr. William B. Chase, of Brooklyn, in a paper read at the recent annual session of the American Medical Association at Atlantic City.

In the order given, the things which throw light on the probable outcome of a major operation are the family history as to longevity, family immunity or susceptibility to disease, recovery of the patient from former illnesses, accidents and surgical operations, and the present standard of health of the person to be operated upon. Doctor Chase states that the relation of the resistance of the patient to the time taken for an operation, the shock incident to it, and the anæsthetic employed is of the highest importance and difficult to determine in advance. Every operation, he says, should occupy the least possible space of time compatible with thoroughness. He condemns intrusting the administration of an anæsthetic to an undergraduate, as sometimes is done.

MEETING OF AIR AND WATER CRAFT

One of the most striking flights of the Zeppelin airship "Viktoria Luise" took place during the recent regatta held at Kiel, Germany, at which were present Emperor Wilhelm and a large part of the German high-sea fleet. The immense, cigar-shaped bag passed swiftly and gracefully over a string of seven yachts while the latter were racing for prizes. Only a little while ago the "Viktoria Luise" added to its fame by flying from Düsseldorf over Holland and around the coast to Hamburg, covering 350 miles in 12 hours. This dirigible seems



exempt from the ill luck which has pursued so many of the Zeppelin airships, for it has never had any mishap although quite recently it made its one-hundredth excursion.

PRIZE FOR ALCOHOL FUEL TESTS

One of the automobile magazines of London suggests that the Royal Automobile Club at once set to work to organize a fund and to offer a substantial prize, even as much as \$50,000, to the person who is able to prove, practically and theoretically, that alcohol meets all the requirements as automobile fuel.

Such a scheme would, according to Motor, London, be worthy of the club and of its position as a society of

encouragement. Apart from benefiting the motor industry, it would help to create a new industry dependent upon agriculture, while England, with such home-grown fuel, would be relieved of the extremely serious risks to all road locomotion arising in the event of a war.

A single electrical company in California claims to transmit current and operate its business over 38,000 square miles of territory included within 30 counties.

THE BRAINS BEHIND THE AMERICAN ENDURANCE RECORD

By A. F. ZAHM, Ph. D.

Emile Berliner, the famous inventor of the gramophone, and of the loose-contact transmitter which made the telephone industrially practicable, after a decade of experimenting with aeroplanes, helicopters, propellers and engines, is now seeing his motor and aeroplane ideas in successful use, though the general public has heard little of his work.

Tests this summer gave his aeroplane the American record and indicated that his thorough investigation will be a material factor in bringing American aviation once again up to, if not in advance of, European achievement. A Columbian biplane, embodying Mr. Berliner's ideas and equipped with a rotary motor of his invention, early in the summer established an American endurance record of 4 hr. 23 min. 15 sec. Mr. Berliner was a pioneer in developing the air-cooled, revolving-cylinder gasoline motor. His primary aim seems not to have been so much a commercial one, as to achieve in aviation the scientific success that characterized his previous inventions; but if well-built fliers of any type have a commercial possibility, that fact will hardly escape so gifted an organizer. He realizes that the one thing essential for dynamic flight is an adequate power plant, a perfectly reliable motor, not too costly to build and operate. This, in aviation, has been the great problem, beside which all others are trivial.

Mr. Berliner's engine has seven radial cylinders which rotate about a common fixed crankshaft, and carry with them the screw propeller attached to a hollow flange, projecting hub-wise; neither pistons nor cylinders have any reciprocating motion; the pistons revolve about the fixed crank-pin, the cylinders about the fixed shaft. The motion of both is therefore continuous, as in a turbine. The cylinders are machined from heavy forged nickel steel, the shaft from chrome

steel, and the crank case is made of vanadium steel. The motor weighs $3\frac{1}{2}$ lb. per horsepower, complete, with abundant margin of safety. In general, it resembles the celebrated Gnome engine, but has many novel and patented features of especial interest to the technician. It may be added that Mr. Berliner's motor experiments antedate by many years the appearance of that excellent French machine.

During the past decade Mr. Berliner has made many experiments with man-carrying helicopters, or vertical air screws. The purpose has been to rise directly from the earth and especially from the surface of water, then advance rapidly through the air by inclining the apparatus forward. His machine has repeatedly lifted a man from the ground, but not with sufficient steadiness to permit of free flight. Recent improvements, however, in the steadiness of thrust and the methods of control seem to indicate that Mr. Berliner is further advanced in the development of a helicopter flying machine than any other experimenter so far as published accounts disclose.

After the endurance record was made, Mr. Berliner and his associates contemplated launching the pilot on a non-stop flight from Washington to New York to manifest more fully the practical air-worthiness of the new biplane, but their attention was soon taken up by their Columbia monoplane of streamline type which has during the summer made some remarkable flights.

A new astronomical distance unit has been adopted. It is called the "siriometer" and is equal to one million times the distance between the sun and the earth, or, approximately, the distance between the sun and the star "Sirius," or again, to be exact, 92,900,000,000,000 miles.

COLORADO'S FIELDS OF TUNGSTEN

Tungsten, which might well be termed the metal of this decade because of its rapid adaptation to a great number of uses besides the familiar ones of an alloy for steel and filaments for electric lamps, is found in limited quantities in many parts of the world, but about half of the world's supply comes from the United States. The greater part of this half is that coming from the apparently almost inexhaustible supply in Boulder County, Colorado. The tungsten found in Colorado is the purest in the world.

So vast is it in extent, and so abundant and easy to mine, that the price of this very valuable metal has gone down until it is now available for very wide commercial use.

The discovery of the remarkable deposit of tungsten in Colorado was more or less accidental. About 12 years ago a prospector happened to drop into Boulder, Colorado, in search of a fortune, as all prospectors are. Tungsten, at this time, was worth more than silver, and compared very favorably in price with gold. While this particular prospector was on an expedition up the old Caribou road, he discovered what proved to be a lot of tungsten ore on the surface of the ground. One can well imagine his surprise, as this same territory had been covered a number of times by other prospectors, and the great treasure overlooked. He hurriedly staked out one claim, then another, and a third, but then he paused in bewilderment, for he saw that loose tungsten ore covered the ground for miles, in fact, as far as the

eye could reach. Therefore, he decided to take up a homestead claim, which was his only way of getting the greatest possible acreage of this exceedingly valuable mineral field. He built many air castles, and tore them down, in order to make room for larger and more luxurious ones, as he went over the great extent of the tungsten field, trying to pick out the richest for his homestead claim.

In a short time this prospector was on the high road to fortune, as he was supplying the market with large quantities of tungsten at very fancy prices. Other miners and prospectors soon arrived on the field, however, and everyone began picking up tungsten ore from the ground and shipping it. This enormous increase in production of tungsten was followed by a very decided drop in its value, and, on the other hand, there was an amazing leap upward in the demand for it, as the price no longer made its use prohibitive. Thus began the era in which all manufactured products depending upon the use of tungsten, and all industries using it were placed upon a more substantial basis, as the supply was no longer uncertain.



Flower-decked muffs made of some light, dainty fabric are becoming fashionable with English women. The term "garden muffs" has been given to them, and the varieties are numerous.

Apparently there is not so much originality in the wearing of slippers having diamond-studded heels as the press of the country

seemed to find when a western woman appeared in Washington, D. C., so shod. In Ancient Rome women ornamented their low shoes with pearls and gold embroideries, and many of the slipper soles were made of solid gold, studded with gems, in an attempt to surpass others in lavish adornment.

HOOD HAT TWISTED INTO MANY SHAPES

A hood-hat combination which is creating considerable interest abroad because of its adaptability, invented by a tourist in Switzerland last winter, is shown in several of the shapes it may



The Shapes the Simple Hood may be Converted Into by a Twist or Two

be changed into in the accompanying illustration. It is made in all-wool flannel or of soft satin in pastel shades, and is equally suitable for motoring, yachting, traveling by train or ship, golfing, hunting, Alpine climbing, etc. Its first shape is that of a simple hood, which can, with a simple twist or two, be turned into a half dozen different forms of smart and becoming hats.

AUTOMATIC DEVICE FOR LOCK RECORD

A combination time recorder and constant watchman is the latest invention of a Chicago man. The recorder is electrically attached to the lock of a store door, private room, safe room or vault, and so arranged as to give an automatic printed record of the exact time the door is locked and unlocked, and who performs these operations.

The system consists of the lock upon the door connected by cleverly concealed wiring to a master clock located wherever convenient. The master clock is in turn electrically connected to the recording machine, which is so small that it may be placed conveniently within a roll-top desk. Employees who open the store in the morning, and close it at night, members of the firm, watchmen, bookkeeper, etc., have numbered keys. When one of these keys is inserted in the lock and the bolt turned in, the recording machine automatically prints upon a ribbon of paper the number of the key, the word "In" or "Out" according to the direction in which the lock

is turned, and the year, month, day, and time of day. The watchman's key is so made as simply to fit into the lock and actuate the recording device without making it necessary for him to open the door unless there is something which demands that he enter. When a burglar comes along or some unauthorized person with an unnumbered key which fits the lock and opens the door, a big bell

within the shop instantly sets up a terrific clamor, which cannot be stopped until the concealed button controlling it is discovered.

ELECTRIC POWER FOR LAKE FREIGHTER

Vessel owners on the Great Lakes are manifesting interest in the news that a contract has been placed for a lake and canal type of boat with electric-power equipment by a concern of New York and Montreal. The contract was placed in England and the specifications call for a "Canadian" freighter with two high-speed six-cylinder generating engines, developing about 350 hp. each, at 400 revolutions per minute, with their dynamos and excitors. The propeller shaft will be fitted with a special squirrel-cage induction motor, reducing the speed to 80 revolutions per minute.

What particularly attracts the attention of lake-vessel men is the fact that externally and from the standpoint of propulsion, the new boat's propeller and hull will be indistinguishable from the usual steam equipment. It will be possible to cut out one of the engines if necessary at any time for readjustment without interference with the other and with only slight loss of speed. Two hundred tons in weight, represented by engines and fuel, will be saved in the adoption of electric power, and fewer men will be required for the engine crew. Another important advantage will be the elimination of the boilers, resulting in an economy of space, which will permit just that much more room for storage of cargo.

ULTRAVIOLET STERILIZER FOR WATER MAINS

The sterilization of water by means of the ultraviolet rays from mercury-vapor lamps, a method which underwent successful tests at the Pasteur Institute in Paris, and which has been described before in this magazine, can be used in direct connection with city



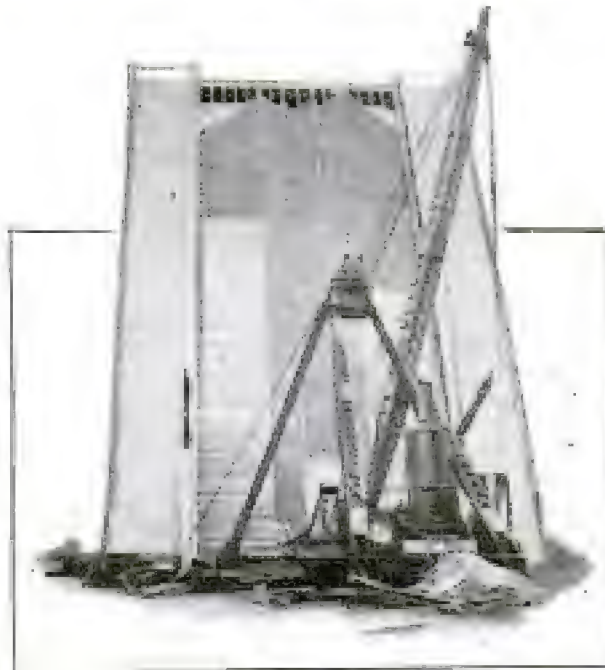
An Apparatus for Direct Sterilization of City Water by Ultraviolet Rays, Capable of Treating 30,000 Cubic Feet of Water an Hour

mains. The apparatus shown in the accompanying illustration is designed for this purpose. The sterilizing cylinder is provided with four handholes, the mercury-vapor lamps being attached to the under sides of the covers. A number of sheet-metal guides serve to direct the water flow close to the lamps. About 30,000 cu. ft. of water may be treated per hour.

ⒸThe Zeppelin dirigible balloon "Schwaben I," used for passenger traffic in Germany last year, was completely wrecked by an explosion at Düsseldorf, Germany, just after its season of flying opened this year.

BASCULE BRIDGE PROVIDES OPTICAL ILLUSION

A 102-ft. bascule bridge recently under construction in Milwaukee, Wis., drew much attention because



A Gabled-Roof Illusion; the Result of Laying Planking at an Angle

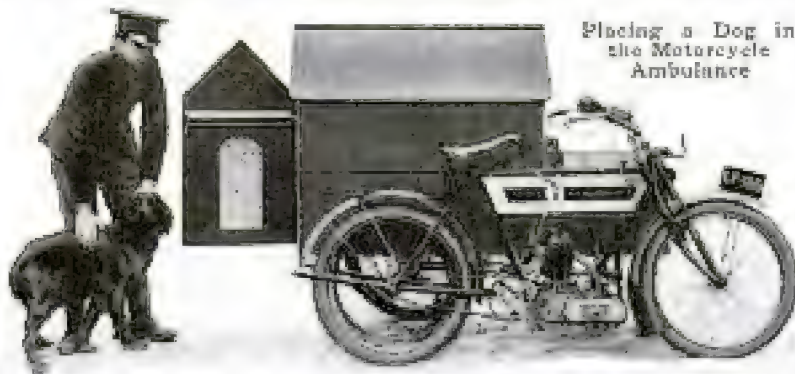
of the peculiar optical illusion provided by it when raised to a vertical position for the passage of shipping. The sections of the under layer of planking were laid at an angle, and the surface layer, but partially done, as shown in the illustration, is laid straight. The illusion of gabled roofs was startling when the bridge was raised.

FAMOUS DELHI PILLAR IS MADE OF WROUGHT IRON

From specimens of metal obtained by Sir Robert Hadfield it has been determined that the famous iron pillar at Delhi is an excellent type of wrought iron. An analysis of the metal shows it to consist of: carbon, 0.08 per cent; silicon, 0.046; sulphur, 0.006; phosphorus, 0.114; iron, 99.72. The lowness of the sulphur percentage indicates that the fuel used, probably charcoal, must have been very pure. The metal contains no manganese, which is rather remarkable, since that element is usually present in wrought iron.

MOTOR AMBULANCE FOR DOGS

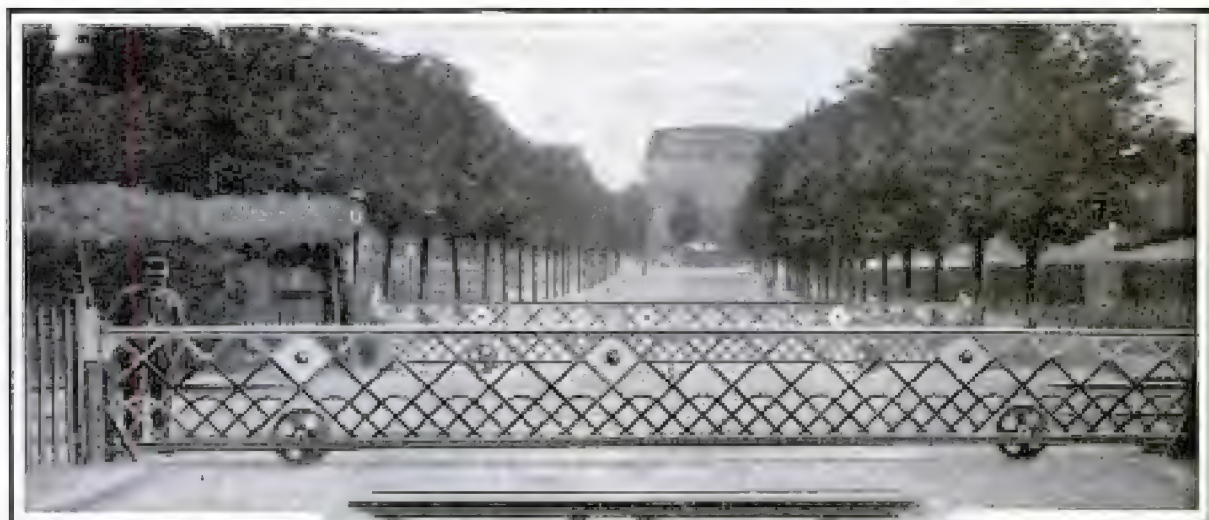
The Knightsbridge Animal Hospital and Institute, London, is equipped with a special motorcycle ambulance



which is particularly useful in answering emergency calls, as, for instance, when a dog is injured on the streets. It has shown itself to be a reliable first-aid ambulance in many cases.

THE WATER REQUIRED FOR LAWN SPRINKLING

The Department of Public Utilities of Spokane, Wash., recently issued a booklet containing, among many other things, some very interesting information concerning lawn sprinkling. The sprinkling of the lawn every day is, apparently, more of a recreation for the householder than a necessity of lawn culture. The booklet draws attention to the fact that a lawn cannot be produced by water alone, and recommends a depth of soil of 12 in., and the use of bone meal, wood ashes, or manure as suitable fertilizers. A thorough watering twice each week is considered sufficient in Spokane.



Crossing Gate Provided with "Cat's-Eye" Lenses, So Called Because They Glow with Reflected Light

The "Lamps" Consist of Red Bull's-Eye Lenses Backed by Silver Reflectors

"CAT'S-EYE" LIGHTS

FOR CROSSING GATES

"Cat's-eye" lamps, so called because they are not luminous in themselves but become luminous through borrowed light, are being used in France on railway crossing gates. Each gate has three red bull's-eye lenses backed by silver reflectors mounted in diamond-shaped frames. When an auto-

mobile approaches the barred crossing the light given out by the machine's lamps is vividly reflected by the "cat's-eye" lamps, giving warning of the presence of the gate. The cat's-eye lamp as a tail light for motorcycles and automobiles was described in a previous issue of this magazine.

CONQUERING SURGERY'S GREAT ENEMY

By LEONARD K. HIRSCHBERG, M.A., M.D.

If you have ever read Pepys' diary or the tales of Boccaccio or other annals of the thirteenth century Black Plague, you will remember with what horror those dying multitudes appalled you. Yet on the battlefield and after the Civil War of half a century ago almost as many men died of collapse, infections or shock from the operations then performed.

With the advent of later surgical knowledge, the discovery of germs as the cause of disease, and the additions of chloroform, ether, cocaine, and other pain-preventing drugs to the doctor's equipment, fatalities during and after operations were reduced wonderfully. Still one in every few thousand cases

would die even after chloroform, cocaine, or ether anæsthesia.

Soon the possibility of death following a surgical operation was made still more remote by abolishing the use of chloroform. It was discovered about 10 years ago that the use of chloroform is decidedly dangerous both in the maternity ward and in the surgical clinic. Gradually during the past few years, as this danger was more and more recognized, and ether more universally used, deaths after childbirth or the surgeon's knife have become rare indeed.

To still further reduce the fatalities incident to operations, Dr. George W. Crile, of Cleveland, some five years

ago adopted laughing gas or nitrous-oxide gas, theretofore used as an anæsthetic agent only by dentists, and applied it, in combination with oxygen gas, in his hospital practice instead of both chloroform and ether. Wonderful to tell, operations lasting many hours are now performed in some of the large American hospitals with only this mixture of oxygen and nitrous oxide.

Nevertheless, with all these marvelous improvements, with all these reductions of danger and possible death, the surgeons were not satisfied. The doctors of the clinics and the research workers of the laboratories knew that life could be made still longer and less hazardous. So they continued their critical researches, and just the other day this same Doctor Crile made another far-reaching discovery.

Through this discovery the possibility of death during or after even the most vital surgical exploration, whether from disease, nervousness or exhaustion, is still further lessened.

When placed under such a safe anæsthetic as laughing gas, man and animal can withstand, without any exhaustion or shock following, three times as much injury and irritation as is the case under ether.

Now in the course of such severe operations as those necessitated after railroad accidents, long falls, severe automobile injuries, broken skulls, pistol wounds, cancers, and the like, the patient's system reacts against every cut, stitch, and pulling together of blood vessels, ligaments, muscles, and nerves, especially under the older anæsthetics, and this reaction produces the exhaustion, collapse, and severe shocks after chloroform and ether.

With these facts before us we can readily understand why a strong robust patient may emerge from the operating room broken and shattered, requiring months or perhaps years to recover fully, says Doctor Crile. It is for the same reason that the same man is shattered and broken if run down by a railway train and mangled; if he has passed through a horrible sensation,

such as having a cold pistol pressed against his forehead in the night by a highwayman; if he has witnessed a murder, or if he has been subjected to any other of the many nerve-shattering experiences of life. Whether they impair or whether they break the nervous system, they are, except for the memory, just the same as surgical operations under ether.

The importance of the new contribution that Doctor Crile makes to surgery lies in the fact that all exhaustion and injurious results can be obviated by not only soothing the brain with an opiate or with nitrous-oxide gas, but by simultaneously disconnecting, for the time being, the place operated on, the field of the injury and of the cutting, from the brain itself.

This is a wonderful discovery. True enough, many surgeons have at times carried out, unwittingly, this very mode of action, this double method of anæsthesia. But they never persisted in it, they never converted the world's great surgeons, and, most important of all, like the great chemists who always handled pitchblende without ever suspecting the radium within, they knew not what they did; and as it remained for the Curies to find the radium, so Doctor Crile was the first to inquire into the whys and wherefores of double anæsthesia.

Physical injury to any sensitive part, he finds, causes a discharge of nervous energy leading ultimately to exhaustion. This discharge of nervous energy is not prevented by inhalation anæsthesia. The exhaustion is due to driving the motor mechanism of the human system. With equal facility may exhaustion be produced by perceptions through the special senses, such as seeing or hearing danger. The human motor mechanism may be driven by a physical-contact stimulation, or it may be driven by perceptions through the special senses. Whatever the cause may be, the stimulus is always through the awakening of associative memory; that is, all action is in accordance with the law of association through memory.

Now then, argues Doctor Crile, the practical application of all this is to conduct every operation so that no associative, painful, or dramatic incident may enter even the narcotized brain of the quieted patient. A pleasant respiratory anæsthetic, such as nitrous oxide, should be used with some internal medicine that quiets the nerves. When the patient is ready for the knife, the site of the operation is completely isolated from the brain by

injecting a new local anæsthetic of his own.

All exhaustion, fright, after-pains, shock, pneumonia, and the other after-effects are thus forever done away with. There is no depression, no lessening of the body's immunity to germ diseases, and the patient leaves the operating room strong and virile, already on the way to uninterrupted convalescence and rapid recovery, and with all the chances in his favor.

LONDON HARBOR IMPROVEMENTS

The harbor of London, which has long been inadequate to accommodate the enormous shipping and to satisfy the demands for modern commerce facilities, is to be improved at a cost of many millions of dollars.

The immediate improvements, enabling great modern vessels to ascend the Thames to London proper, comprise the construction of a great dock, which will be named South Albert dock, at a cost of approximately \$12,000,000. This dock will be about 4,600 ft. long, with a width of 600 ft. and a depth of water of 38 ft. It will be reached through a lock, 800 ft. long by 100 ft. wide, with a depth of 45 ft. The intention, when this dock is completed, is to greatly deepen the Thames and to construct a second dock, to be called the North Albert, at a cost of more than \$20,000,000. This dock will be about 7,400 ft. long, with a width varying between 930 and 1,000 ft., and a normal depth of 45 ft. The lock which will give access to this dock will be 1,000 ft. long, 130 ft. wide, and will have a depth of 52 ft.

HORSES TAKE COOLING SHOWER BATHS

Philadelphia horses have been provided with shower baths during the hot weather. The accompanying pho-



Shower
Baths for
Philadel-
phia
Horses on
Hot Days

tograph shows a humble delivery horse "getting his," and he seems to enjoy it. All day during the hot season horses could be seen in line, the drivers waiting for a chance to give their animals a taste of the luxury. The shower baths were placed in the streets by the Women's Society for the Prevention of Cruelty to Animals, and were so constantly in use that they were considered a great success, and will be supplied another summer.

BEAUTIFUL ANCIENT GLASS UNEARTHED IN PALESTINE

Several magnificent examples of ancient millefiori (thousand flowers) glass of rare beauty and value have recently been unearthed by natives in Palestine. The plates and bowls were found in ancient tombs on the coast and are valued at from \$500 to \$1,000 each.

Millefiori glass reached its finest development in Grecian-Roman times. As far as is known, this glass was made by cutting bits from a stick or cane of glass, itself formed by uniting a number of small rods, and then placing these bits in a mold in such manner as to produce any pattern desired.

SCIENTISTS MAKE CHEMICAL RUBBER

British scientists are indicating their belief that the long-sought method of making synthetic rubber, or rubber by chemistry, has really been found, and are maintaining their belief in spite of the doubts cast by previously announced discoveries and subsequent failures. The process of making rubber from fusel oil was recently announced by Prof. W. H. Perkin, of Manchester University, on behalf of a group of scientists who had conducted the experiments. Of the results the conservative and authoritative London Lancet says: "It is probable that we are recording a synthetic triumph of the greatest moment to the world, for it is not a rubber substitute that has been made, but rubber itself."

Not only do the British scientists claim to be able to produce rubber for

20 cents a pound while the natural product is selling for 80 cents, but they also announce that the by-products of the process are fuel alcohol, suitable for automobile engines, and acetone, the incorporating element in the manufacture of the high-power explosive known as cordite. The alcohol can be marketed for much less than gasoline and is a safer and cleaner fuel. Acetone, in the limited available supply costs at present \$450 a ton. As a by-product of a rubber manufacture it is claimed that it can be sold for \$150 a ton. Modern warfare depends on acetone to prevent the spontaneous explosion of cordite.

If the hopes of the London scientific authorities are realized, not the least of the results of the commercial manufacture of rubber will be a tremendous increase in the growing of corn and potatoes throughout the United Kingdom. The Irishman's potato patch will come into its own. The process of creating man-made rubber,

stated in its simplest terms, consists in reducing a moist mixture of cereals and potatoes to a semiliquid starch and then by a double fermentation converting this starch into fusel oil, alcohol and acetone. The fusel oil is converted into a substance called isoprene, which was until recently only known as a distillation product of natural rubber, and which when left for a time in contact with metallic sodium becomes a pure white rubber.

The attempts to produce rubber by chemical means had failed until 18 months ago when a German, Prof. Carl Harries, of Kiel University, discovered isoprene and later made it from oil.



One of the Ancient Millefiori (Thousand Flowers) Plates
Discovered in Tombs in Palestine

turpentine. He even secured rubber from this process, but only at tremendous cost. Then the race with Dr. F. E. Mathews, Sir William Ramsay and Professor Perkin started. A French scientist was also concerned in the discovery, his contribution being a cheap method of producing the fusel oil from fermented potatoes and cereals, so that the discovery might well be called international. Just three months after the English scientists had completed their experiments and secured their patents their German rival arrived at the same results, but found that he was too late to profit by them.

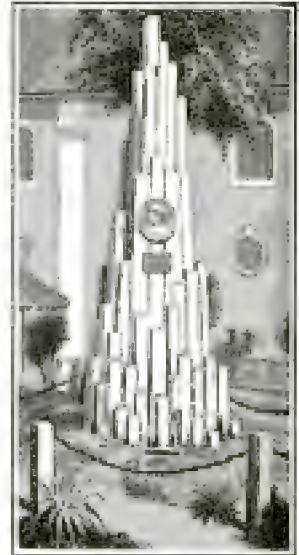
Experiments have shown that the synthetic rubber can be vulcanized like the natural product. An automobile tire made of the artificial product outlasted a tire of the natural rubber by several weeks, both being used on the same vehicle. To date, however, the experiments have gone no farther than the laboratory stage. Automobileists who look forward to a day of cheap tires and a cleaner, cheaper fuel than gasoline must wait until some one tries the experiment of producing man-made rubber on a large commercial basis.

MOVING BELTS BREAK FILAMENT LAMPS

Investigation in factories where graphitized-filament lamps, used to replace the ordinary carbon lamps, were found to break as soon as placed in the sockets, showed that the failure of the lamps was due to the fact that they were all placed near a moving belt. Although imperceptible, static charges from these belts collected on the globes, setting the filaments in rapid vibration and rupturing them. Equipping each socket with a metal reflector is said to be a simple and effective method of preventing such damage.

A BEAUTIFUL MONUMENT OF NATURAL CRYSTALS

In the little town of Steinschönau, Bohemia, is an exceptionally unusual and really beautiful monument formed out of natural crystals, the longest of which are from 23 to 26 ft. in length. The curious monument was erected by a society of war veterans, at their fifty-year jubilee, in honor of Emperor Franz Joseph. The crystals, which are pentagonal or hexagonal in cross section, were taken from a basalt formation located near Steinschönau.

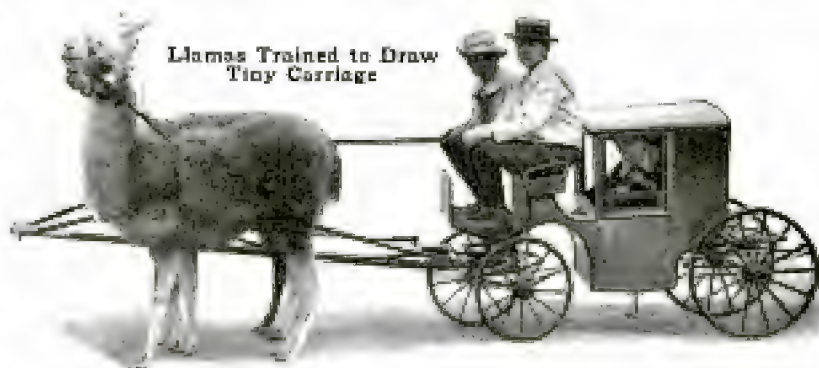


Courtesy Über Land und Meer

LLAMAS IN HARNESS

An attraction at Hamburg's famous zoological garden is a pair of tame llamas, that carry passengers about the grounds. They are declared to be the only animals of their kind in Europe that have been trained for this purpose.

The llamas draw a carriage, and at



Llamas Trained to Draw
Tiny Carriage

a recent test it was shown that they can easily pull a load of 450 lb. They are quite docile and readily answer to the rein.

LIFTING AN AUTO BY ONE-MAN POWER

The auto jack shown in the accompanying photograph is capable of rais-



One Man Can Operate This Auto Jack

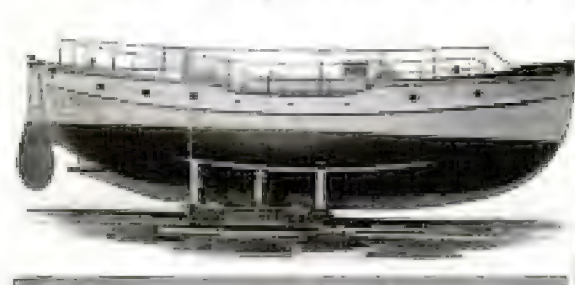
ing a heavy motor car with no more power than that one man is capable

of exerting. The automobile is first run into position over the two rectangular frames, which are connected by a strong chain. Once in place, the "thrust bar" at the left is set in operation by means of which the frames are gradually brought to an upright position. The threaded pillars on the four corners of the frames are easily adjustable and by turning them the car may be raised as desired.

THIRTY-FIVE-FOOT MOTORBOAT CROSSES ATLANTIC

The little 35-ft. motorboat "Detroit," built especially to cross the Atlantic under her own power, made the trip in 24½ days. She arrived safely at Queenstown, Ireland, on Aug. 7. The little boat started out with the expectation of making, all told, a trip of

about 4,000 miles, of which the voyage from Detroit to New York was the first stage, the transatlantic voyage the second, and a continuation of the voyage to St. Petersburg the third. This is the longest voyage ever attempted by a sea-going motorboat of such small size.



Transatlantic Motorboat before Launching, Showing One of the Bilge Keels Provided to Keep Her Steady in a Sea

The "Detroit" is 35 ft. long, 9 ft. wide, and draws 5 ft. of water when loaded down. She is driven by a 16-hp. engine, and has a speed of about 7 miles an hour.

The greatest problem in constructing a transatlantic craft of this size

The "Detroit" Starting on the First Stage of the Journey



Photos Copyright, 1912, by Mathews East Co.

was to find storage for the amount of gasoline necessary for a 2,700-mile trip. About 1,200 gal. of gasoline was carried in seven tanks placed in the hold of the boat, and two additional tanks were located on the deck amidships. A crew of five men made the trip, and food sufficient for 90 days was carried. None of the crew was allowed to carry matches, owing to the large amount of

gasoline on board. All matches were kept under lock and key by Captain Day, who gave them out only when positively needed. The little boat was lighted by electricity throughout.

The little craft encountered heavy weather with a succession of gales and high seas. She was obliged to heave to nine or ten times and pitched tremendously.

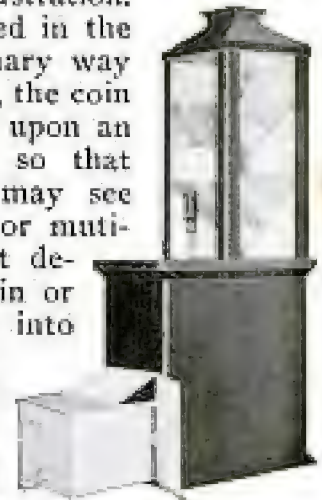
NEW DIRIGIBLE BIGGER THAN EVER

In the construction of the German dirigible airships the tendency among the builders of this type of aircraft appears to be to increase the size, notwithstanding recent disasters that, naturally, might prove discouraging. The latest Zeppelin-type ship produced by Siemens-Schuckert is 386 ft. long and has a maximum diameter of 42 ft. 10 in., with a volume of 530,000 cu. ft. Three impervious partitions divide the four compartments. An air balloon is contained in each of the three forward compartments, the first of which is almost a perfect hemisphere, reinforced by 10 layers of rubberized linen. Gas which escapes from the forward compartments is received through safety valves into the fourth compartment which is maintained at normal atmospheric temperature. In shape the latter is an elongated cone. The keel of the ship measures 262 ft. in length and is constructed of steel framework. In this are carried supplies of water and gasoline and two 24-hp. motors for filling the balloons and operating the safety valves. Attached to the motor is the guiding rudder, five planes of 13 by 4 ft. Communication between the three cars suspended from the keel is maintained by a telegraphing device. In the middle car are located the guiding wings. Equipment carried in the other cars includes a 125-hp. motor, two depressing rudders and two two-bladed side screws. The blades are 9 ft. in diameter and run at 700 revolutions. The center screw has four blades and runs at 750 revolutions.

FARE BOX WITH NOVEL AUTOMATIC FEATURE

A fare box having an ingenious automatic feature, and designed for pay-as-you-enter cars, is shown in the accompanying illustration.

The fare is placed in the box in the ordinary way by the passenger, the coin or ticket resting upon an aluminum plate so that the conductor may see that counterfeit or mutilated coin is not deposited. The coin or ticket is dropped into the final receptacle by means of a small lever, and it is the automatic action of this cash box

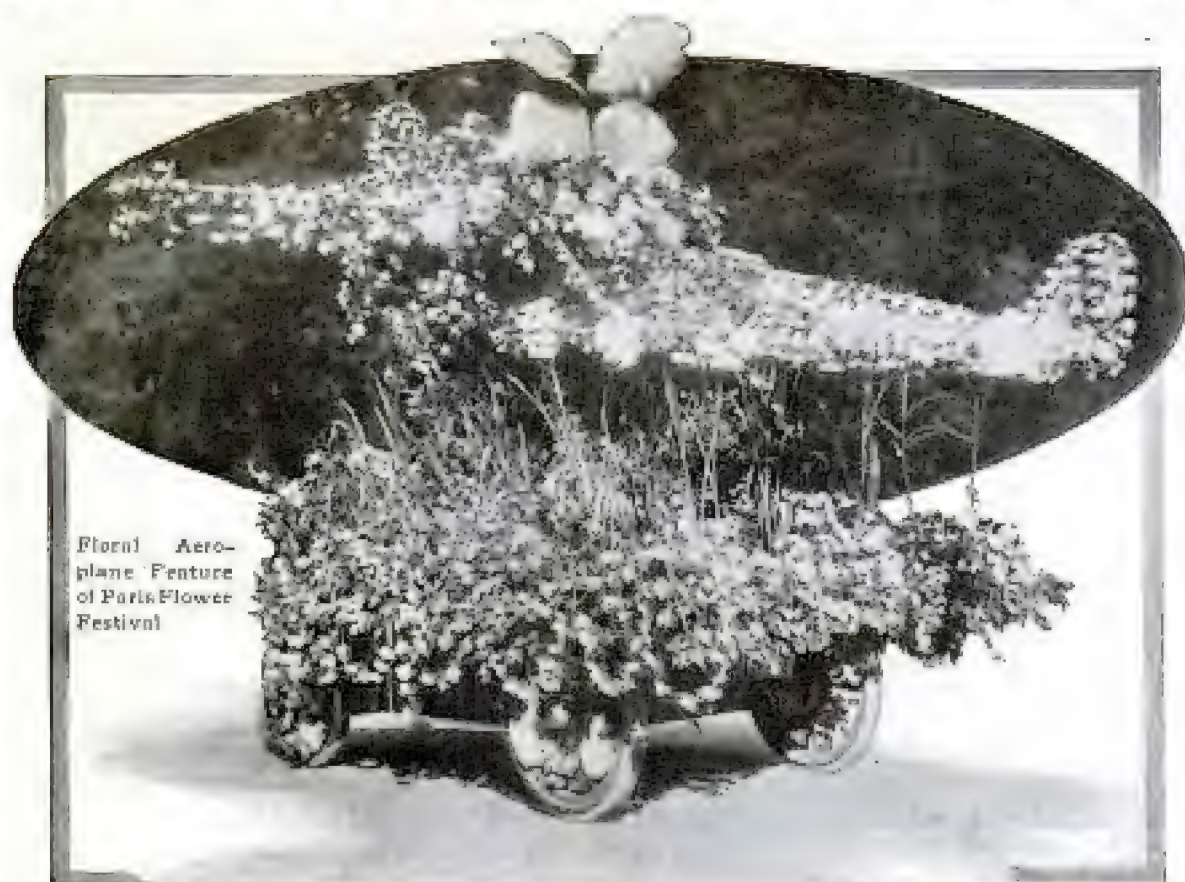


which provides the interesting feature.

To remove the cash box from its position, it is necessary for the dispatcher or other railway official to open the outside of the fare box with a key. The cash box can then be easily removed, but in removing it the lid or cover, which up to this time has remained open so that the fares would fall into it, automatically closes and locks. The dispatcher now has the cash box in his possession, but the key is in the treasurer's office, and the fares cannot be removed until the box is delivered there.

A new cash box is placed in the fare box at the commencement of each run. It is claimed that no registration of fares is necessary with this type of collector.

FLORAL AEROPLANE CATCHES PARISIAN FANCY



One of the most loudly applauded features of the recent Fête des Fleurs, or flower festival, in Paris, was the float shown in the accompanying pho-

tograph—an aeroplane mounted high over a motor car. The floral airship was of the monoplane type and carried an airwoman and a passenger.

MARATHON MILKERS ON A BIG DAIRY FARM

On the average dairy farm the man who can milk 15 or 20 cows twice a day is ranked as an excellent milker. Yet on a milk company's farm in New Jersey, 10 operators are milking 350 animals twice daily, an average of 35 cows per milker. Ever since modern dairy husbandry began to approach an intensive development the problem of the milk farm has been how to most efficiently utilize the labor of the milking force between milkings. In the winter time especially this was a hard nut to crack.

The manager of this eastern dairy farm got his mind to working overtime and devised the plan of develop-

ing his milkers into specialists who milked for 10 hours a day and performed no other labor. He corresponded with the managers and owners of other large milk farms in order to obtain their opinions concerning his new method, and found they did not believe it would work. In no wise discouraged this progressive manager put the proposition before his milkers and asked them if they would be willing to test out the plan. They enthusiastically assented.

Under this novel system the milkers begin work at two o'clock in the afternoon and milk steadily for five hours after which they have a seven-hour

rest period. They resume milking at two o'clock the next morning and continue until seven o'clock when they again have the succeeding seven hours for leisure and recreation.

Only natural milkers, men who do not overly exert themselves and, in consequence, easily tire, are enlisted in this marathon milking work. After drawing the milk from each animal the milker has one and one-half minute's rest during which time he carries the pail of milk to the weighing room where he washes his hands as the milk is being weighed and emptied from the pail. This brief period is sufficient to

relax and rest the forearms and hands of the operator.

On the average, the dairy worker on this farm milks a cow every 8.57 minutes or 35 animals in 300 minutes. The fastest operator handles 40 cows in this time or a cow every 7.5 minutes. For the past 18 months the method has been in successful operation and both the men and the management are thoroughly satisfied with the system. The men receive 17½ cents an hour for their services, as well as being comfortably quartered and fed. Each milker works seven days in the week without any holidays.

MODERN VIOLIN BETTER THAN A STRAD

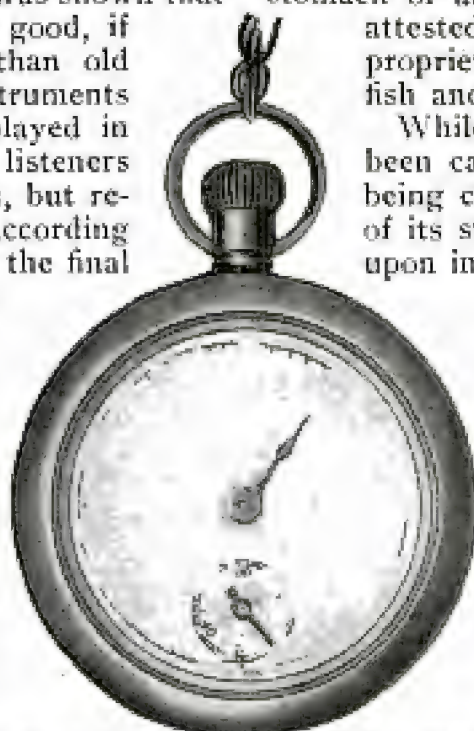
At a trial recently made in Paris, by a number of experts, it was shown that modern violins are as good, if not better in sound, than old ones. A number of instruments were numbered, and played in a darkened room, the listeners not knowing the marks, but recording their verdict according to the numbers. When the final vote was taken it was found that the instrument having the largest number of votes was of Belgian manufacture, made this year, while the second was French, manufactured in 1911. A Stradivarius was voted as third best (although valued at many thousands of dollars more than the modern violins which took a greater number of votes), and a Grancino fourth, but the fifth and sixth were also of modern make.

¶A railroad near completion between New York and Boston is described as having no grade crossings and no signboards along its entire right of way.

BIG FISH CARRIES WATCH IN THE STOMACH

That a watch was found in the stomach of an 8-lb. fish, is the story attested to by Alfred H. Hayes, proprietor of a Buffalo, N. Y., fish and game store.

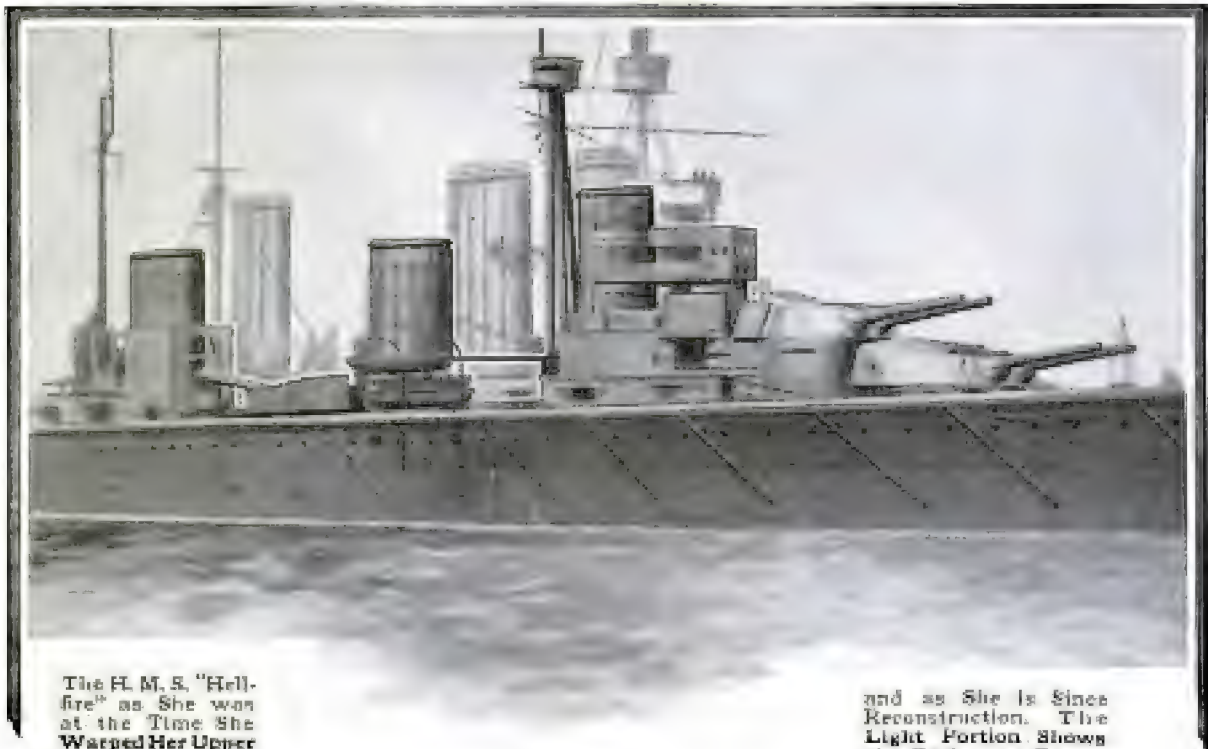
While the fish, which had been caught in Lake Erie, was being cleaned, the great weight of its stomach was noticed, and upon investigation, a watch was found in it. About an inch of chain was attached to the watch, indicating that the owner probably had dropped it into the lake. Upon being wound up, the watch started to run, so the fish could not have been the possessor of it very long.



Watch That was Taken from the Stomach of a Lake Erie Fish and can Still be Wound and Run

¶Experiments have recently been made in Europe looking to

the utilization of paper in the manufacture of pneumatic tires, tests recently made having convinced the experimenters that paper has the strength of metal, the elasticity of rubber, and a cheapness that is to be found in neither of these materials; all important qualities.



The H. M. S. "Hell-fire" as She was at the Time She Warped Her Upper Works with Fire,

and as She is Since Reconstruction. The Light Portion Shows the Cruiser as Reconstructed

THE RECONSTRUCTED H. M. S. "HELLFIRE"

The British battle-cruiser "Lion," which became widely known as the H. M. S. "Hellfire" because of the volume of flame belched from her funnels during the remarkable speed test in which she made 31.5 nautical miles (35.75 land miles) per hour, has now undergone the extensive alterations to her superstructure found necessary to protect her from herself. It will be remembered that the flames rose to a

height of 50 ft. above her foremost funnel and that the heat was so intense as to twist the gun-control platform and every piece of metal on the navigating bridge out of shape.

In the alterations the tripod mainmast has been replaced by a single mast, which is located forward of the foremost funnel instead of behind it, and all three funnels have been altered in position and size.

DETERMINING HOW MUCH PURE AIR FIRE NEEDS

Experiments to ascertain how little oxygen in air would still permit fire and how much carbon dioxide, the harmful gas produced by combustion, is required to prevent fire, have been carried on by G. A. Burrell, chemist at the Pittsburgh Testing Station. Different lamps were placed under a bell jar and allowed to remain until their flames were extinguished. Thereafter the atmosphere in the bell jar was analyzed and the results noted. Three per cent of carbon dioxide and 16.5 per

cent of oxygen remained after a bonneted Wolf mining lamp, burning benzene, had been burned to the point of extinction. The same kind of lamp without the bonnet, burned until there were 3 per cent of carbon dioxide and 15.82 per cent of oxygen. The jar's content was 2.95 per cent of carbon dioxide and 16.24 per cent of oxygen after a candle flame was extinguished. An acetylene lamp continued to flame until there was 6.3 per cent of carbon dioxide and 11.7 per cent of oxygen, a mixture deadly to human life. A bunsen burner from which issued a flame of natural gas was extinguished

when the bell jar contained 3.25 per cent carbon dioxide and 13.9 per cent of oxygen.

PUNKAH BOYS EXTEND ACTIVITIES

Here is an extension of the activities of the punkah boy and his fan, so common in the far East. This home refrigerating machine, set up in Hanoi, Indo China, is connected by chain to a tandem-bicycle frame and operated by coolies. Ordinarily the machine is operated by an electric motor but no current being available, the motor power is furnished by coolies. The machine was set up to make ice for drinking water and for table purposes in a hot climate.

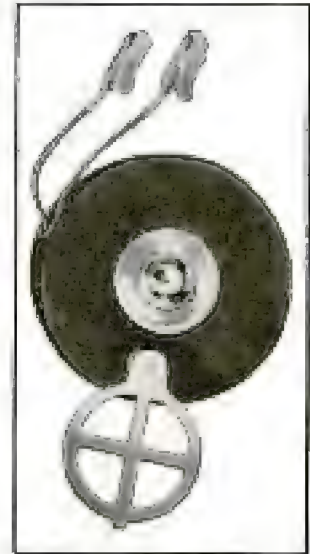
The machine is the result of the studies and experiments of the Abbé Marcel Audiffren, a French scientist. Some have been running ever since they were installed, over five years ago, without repairs or recharging with the refrigerating chemical, which in this case is sulphur dioxide. The machine operates on the compression system and consists of two globes joined by a hollow shaft which carries on its extension a pulley or crank. Its external appearance is that of a dumb bell. It is simple in operation as there are no joints, valves, gauges or stuffing boxes. It is only necessary to place the machine in its bearings, fill the condenser and refrigerator tanks with water and apply the power in order to have at will within a few minutes, cooled water or ice.

A PORTABLE LIGHT FOR MOTORISTS' USE

The trim case shown in the illustration is not intended to inclose a measuring tape, as might be expected. It is a portable light, intended for automobilists and motorboat users.

Current is obtained from a dry battery of four cells, such as is needed for the motor sparking. The extension cord can be lengthened at will and locked with a thumb catch. Two spring-clip terminals are attached to the free ends of the cord

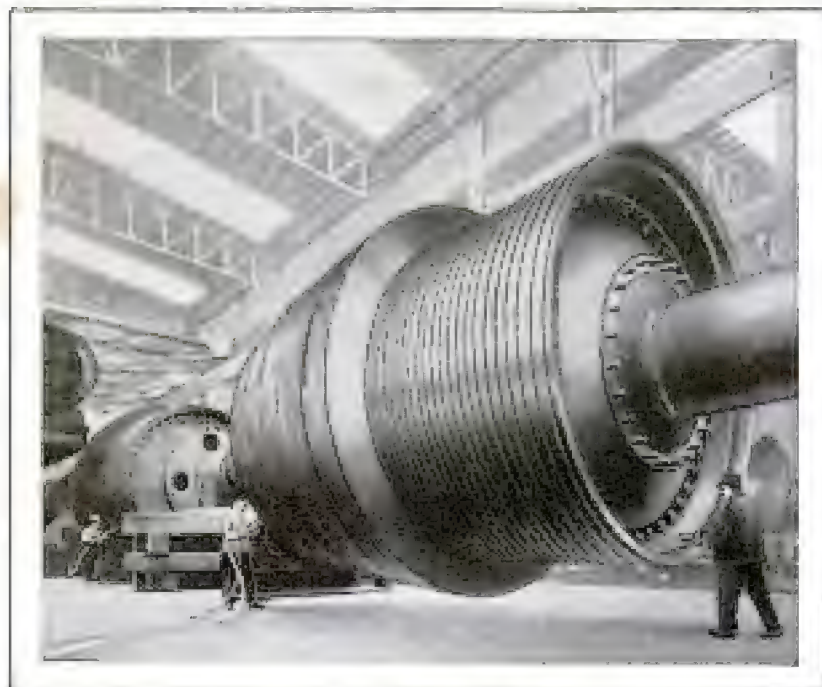
which can readily be snapped on the battery of an automobile. A 6-volt, 2-cp. lamp is used which fits into one side of the case and is backed by a reflector. A guard protects the lamp when not in use. This guard, as shown in the drawing, may be used



Punkah Boys of Indo China Operating Refrigerating Machine by Foot Power



to carry or hang up the lamp. With this neat illuminating device, motor-boats or cars may be examined without danger of igniting gasoline or other inflammable material. Besides other advantages winds are powerless against it.



A Section of One of the Great Turbines Which will Drive the German Transatlantic Liner "Imperator"

THE TURBINES OF THE "IMPERATOR"

The German transatlantic liner "Imperator," the largest vessel yet launched, mention of which has appeared in this magazine from time to time, will be driven at a speed of at least $22\frac{1}{2}$ knots (25.90 miles an hour) by turbines. Because of their great size and relative delicacy, these turbines have attracted much attention. One of the immense rotors weighs 135 tons, contains 50,000 blades, and is capable of developing 22,000 hp. The casing inclosing the rotors is 25 ft. long by 18 ft. wide, the propeller shafts are 18-in. in diameter, and the four-bladed bronze propellers are 16 ft. in diameter.

Recent statistics show that New York City has 20 industries, each of which has an annual product valued at more than \$20,000,000.

MOTOR HORN SCARES OFF BURGLARS

A novel burglar alarm, constructed of wires, batteries and the electric horn from an automobile, proved effective in a recent instance. A Chicago motorist

had suffered from the depredations of midnight marauders in the garage where he kept his car, several blocks distant from his residence. On three different occasions thieves had broken into the building and had removed from the car all the attachments that could readily be turned into cash. In order to circumvent a possible fourth raid, the automobile owner fitted up an alarm of the usual type, save that in place of a gong the horn was utilized, and made connection with the door

of the garage. The burglars soon thereafter returned for another visit which proved to be their last. When the door was forced, the horn emitted such a piercing shriek that the whole neighborhood was awakened from slumber and a patrolman who happened to be near arrested the two robbers.

\$2,000 PRIZES FOR FLIGHT DURATION RECORDS

The Aero Club of France has offered prizes totaling \$2,000 for a duration "Criterium," open from Aug. 15 to Dec. 31, 1912, to be awarded to the aviator who makes the longest flight without landing. The present record stands at 11 hr., 1 min., and the holder, Georges Foury, has declared that he is ready to fly 16 hours, if necessary, to retain the prize. An interesting and only slightly speculative figure is secured by multiplying the greatest aeroplane speed yet accomplished, 105

miles an hour, by the longest duration in reasonable prospect of accomplishment. The product, 1,680 miles, becomes the distance, then, that it will be possible to fly without a landing as soon as the fastest aeroplane yet made becomes capable of carrying as much fuel as any yet made. This prospect, which is anything but remote, since the two present records are held by fairly similar machines, will especially interest the crossing-the-Atlantic enthusiasts, in that only a further addition of 100 miles to the flight radius now definitely in reach will suffice to render the hoped-for result at least theoretically attainable.

A QUAIN RESIDENCE

The pyramidal structure shown in the accompanying illustration is the home of a bachelor living northwest of Miami, Fla. It is constructed of concrete throughout. The top section is open and serves as a receptacle in



Concrete House of Queer Design

which to catch rain water which passes down the pipe on the side of the building to a cistern.

COPPER PONTOONS FOR HYDRO-AEROPLANE

Copper-covered pontoons figure in the efforts of Earl Reid, the airman, to



Copper-Covered Aluminum Pontoons for Hydro-Aeroplane

establish records in a hydro-aeroplane, at the League Island navy yard, near Philadelphia.

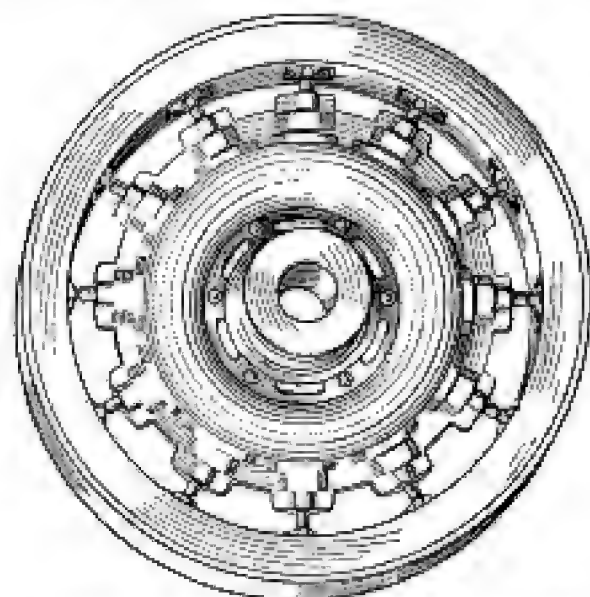
His former pontoons were of aluminum and as it was impossible to solder this metal so as to exclude water, the pontoons soon became too heavy for fast work. He has now reduced the weight of the aluminum by drilling holes in it, after which the pontoons were sheathed with a copper coating one five-thousandth of an inch in thickness. With the new "skin," friction has been considerably reduced.

CENTRAL ARM RESTS FOR REAR AUTO SEATS

The rear seat of a touring car of British make is now being provided with an ingenious central arm rest, designed to increase the comfort of the users in that it provides a rest for both arms. It cannot, of course, be used when the rear seat is occupied by more than two persons, for which reason it is so constructed as to be quickly and easily detachable.

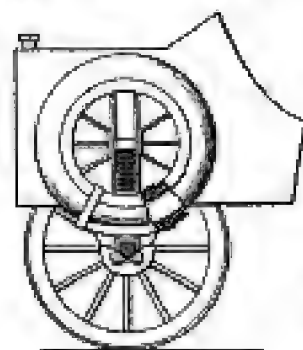
GETTING THE TIRE OFF THE GROUND

Two interesting methods of getting the pneumatic tire off the ground, so that it will not be subjected to wear



An Automobile Wheel with Pneumatic Tire Placed between the Hub and the Wheel Rim

and tear, yet will have the cushioning effect that makes such tires necessary, are shown in the accompanying drawings. One is a wheel within a wheel, the pneumatic tire being located between the axle and the wheel rim.



Plunger heads bear upon the pneumatic tire. The other drawing shows another inventor's idea of how the pneumatic tire can be

got off the road and yet be a shock absorber.

'WAY FOR THE WEATHER WIRELESS!

Weather dispatches are now to have precedence over all commercial messages flashed by wireless throughout the Atlantic. This is the first actual step toward the proposed international weather and storm bureau which was

recommended by the recent weather congress in London at the instigation of the American representatives. Heretofore weather and storm observations, when relayed from one ship to another, were often delayed while commercial messages were being transmitted. Thus, by the time the observations reached Washington they were so old as to be practically valueless in the preparation of the weather and storm charts. Under the new arrangement emergency calls and messages of warning are the only ones which are to be given precedence over the weather and storm observations.

Prof. Willis Moore, chief of the United States Weather Bureau, has recently pointed out an important feature of the proposed ocean weather service, additional to weather-reporting service by the regular transatlantic liners which was discussed in these pages in August. He believes that weather observations taken by tramp steamers sailing in those portions of the Atlantic not included in the paths followed by the steamers, which have set routes, will be of the greatest value when once the international weather and storm bureau is put into operation. Such observations will make it possible to prepare storm and weather charts for the entire Atlantic and will enable the weather bureau officials both in this country and in Europe to follow the paths taken by storms which are not in line with the so-called "northern" and "southern" transatlantic passages.

A nine-word cablegram recently sent from New York to a Berlin electrical journal with the request to forward it around the world back to New York, reached its original sender after 16½ minutes, having passed 16 relay stations and been treated all the time as an ordinary message. Eleven years ago, when the transpacific cable was opened, a telegram was sent around the world in 9½ minutes, but every relay station was then prepared for its coming and immediate transmission.



Temporary Repair for Lead-Pipe Leaks

While excavating on city work a great deal of inconvenience is often caused by puncturing the lead pipes with the picks used by the workmen. As a temporary repair I have driven a wood plug into the hole tightly and calked the lead around it with a blunt tool. A pipe repaired in this way will be watertight and will stand the ordinary city-water pressure.—Contributed by N. W. Wickham, Norwalk, Ohio.

Tool-Width Gauge for an Anvil

A handy device for a blacksmith who has a number of different tool widths to forge and sharpen, such as rock drills and miners' tools, is a width gauge for the anvil. Such a gauge can be easily made of metal, $\frac{5}{8}$ in. thick, 3 in. wide and as long as is necessary for the number of different widths. Notches are cut in the metal as shown in Fig. 1 for the different widths and then the metal is riveted to a U-shaped piece that fits over the soft part of the anvil. Its location for

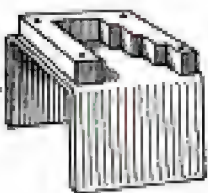


FIG. 1

The Width of a Red-Hot Tool may be Easily Determined When Slipped into the Gauge

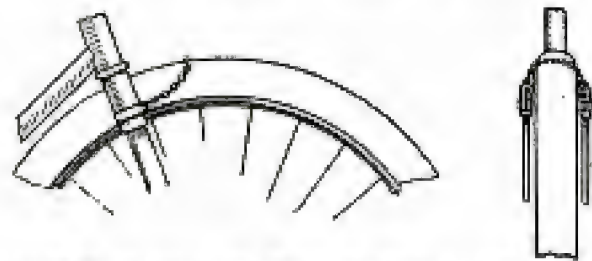


FIG. 2

use is shown in Fig. 2. The gauge is easily slipped on and off the anvil.—Contributed by Thomas Bound, Rochester, N. Y.

Preventing Tire Punctures from Glass with Chains

The greatest annoyance the bicycle rider has to contend with is the small particles of glass which cannot be



Particles of Glass are Removed from a Tire Casing by the Chain Before They Enter the Inner Tube

seen and avoided but which are picked up on the tread of the tire and gradually pounded through, as the wheel revolves, causing a puncture. A careful examination will prove that glass rarely, if ever, punctures the tire the first time around. It is picked up on the tread and held and is gradually forced in as the wheel revolves.

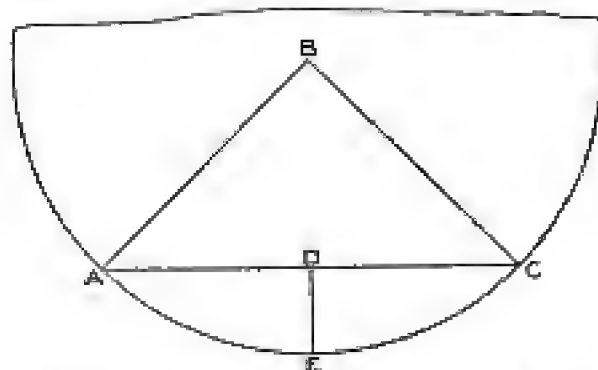
By attaching a piece of flat chain, such as used on the flush-water tank in bath rooms, to the front fork and rear frame in the manner shown in the sketch, so that it will lie flat on the tire, all small particles of glass will be pulled off as soon as they come in contact with the chain.

I have used the chain for about six months without having suffered a puncture, and my tires are absolutely free from glass cuts, proving that the chain pulls the glass out, in fact, never gives it a chance to take hold. The chain does not wear the tire a particle and it affords me a great deal of pleasure to watch it pull off anything that may be picked up while riding the bicycle. It is equally efficient for mo-

torcycle and automobile tires. Care should be taken to have the chain rest immediately on top of the tire, so as to have it slide freely.—Contributed by Dr. Theodore F. Krey, Detroit, Mich.

To Quickly Find the Circumference of Any Circle

Mechanics often have need of ascertaining the circumference of a circle quickly. There are several rules for finding these figures but most of them



The Triangle as It Is Laid Out on the Circle to Obtain the Circumference Quickly

require long and complicated calculations in fractions and decimals, which many have not the time or knowledge to use. I have found the following rule a quick and easy way for solving this problem correctly.

Lay out a circle having the desired diameter and place the corner of a square in the center and draw the lines AB, BC, and AC. Also draw the line DE, from center of line AC and at right angles to it, to the periphery of the circle. Three times the diameter of the circle with the length of the line DE added will give the desired circumference, as nearly correct as needed for practical purposes.—Contributed by R. Edwards, Portland, Ore.

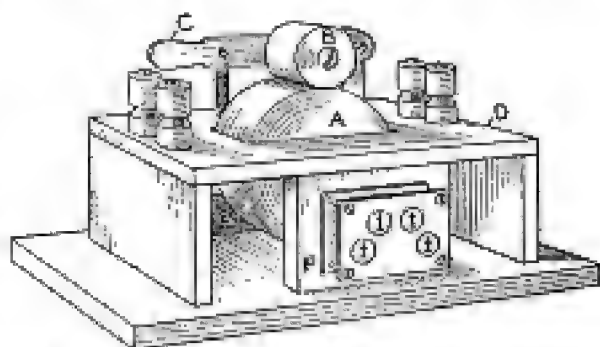
Repairing a Broken Carborundum Wheel

A new carborundum wheel, 4 in. in diameter, had been broken and I repaired it successfully as follows: The pieces were placed together and chucked in a lathe, and a circular groove, about $\frac{1}{8}$ in. deep and 2 in. in

diameter, was cut in each side with an old file. The parts were then bound together with a wire, and removed from the lathe. A ring of fireclay, a little larger in diameter than the grooves, was placed flat on a board and melted babbitt poured in to fill the grooves and surface. This formed a flange on each side. The wheel was then returned to the lathe, the flanges faced off to $\frac{1}{8}$ in. in thickness and the hole bored out to the right size. When the wheel was placed on the arbor the nut was drawn up firmly. The fracture is almost invisible.—Contributed by Samuel Hughs, Berkeley, Cal.

A Wire or Rope-Measuring Machine

A simple and very convenient wire or rope-measuring machine may be made as shown in the accompanying illustration. The wire or rope to be measured passes over the top of the main wheel A and is guided by means of the two upright rollers at each end. One of the rollers at each end may be mounted upon an adjustable base, which will afford a means of changing the distance between the rollers to meet the requirement, depending upon the diameter of the rope or wire being measured. It would, no doubt, be best to so arrange the adjustable bases that the movable rollers



The Wire or Rope Revolves the Wheel That Records the Turns, as It Passes through the Machine

will be held against the others by a tension spring.

A second wheel, B, is mounted on a handle, or lever, C, which is pivoted at one end, as shown in the sketch. This second wheel normally rests upon the

main wheel, A, but will rest upon the wire or rope being measured when it is in place on top of the main wheel. A small downward pressure should be exerted on the handle C when the wire or rope is being drawn along, in order that the main wheel always turn. This pressure can be easily supplied by a coil spring with one end attached to the handle C and the other end to the piece D.

The shaft of the main wheel A is supported by the two pieces, E and F. On the face of one of these pieces is mounted the gear train from an old electric meter. This gear train is mechanically connected to the axis of the main wheel in such a way that the indicator on the right-hand dial moves over one small division when the main wheel rotates once. Now, if the circumference of the main wheel has been made one foot, the readings on the dial will be in feet. The difference between the final reading of the dial and its reading when the measurement was started will be the length of the wire or rope measured. A small flange may be placed on each side of the main wheel which will aid in guiding the wire or rope. Such a device will be exceedingly useful and can be constructed at a very small cost.

Shade for Electric Sign Lights

Electric lights used in signs can be made more effective if each globe is inclosed in a bright reflector sleeve. These reflectors can be readily made of nickelplated sheet metal, cut as



FIG. 1

The Shape to Cut the Metal, and as It Appears When on the Globe

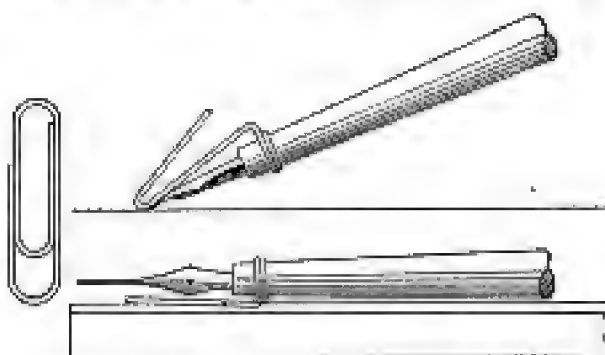


FIG. 2

shown in Fig. 1 and bent to inclose the globe as in Fig. 2. The reflected rays from the globe are concentrated in one direction.—Contributed by S. Yamashita, Hoquiam, Wash.

A Fountain Ruling Pen

Having need for a straight-line ruling pen, I resorted to the use of a fountain pen and a paper clip as illustrated.



The Paper Clip Attached to the Pen to Keep the Pen Point Away from the Ruler Edge

The larger end of the clip was bent two turns around the barrel of the pen and the remainder of the clip bent to extend just beyond the end of the pen and then turned back as shown.—Contributed by E. C. Ramsey, Columbus, Ohio.

To Remove a Stud

A very effective way to remove a stud is shown in the accompanying sketch. Two nuts are turned onto the stud C; the wrench is placed on the nut A and turned to the left, the nut B locking A and keeping it from turning off. The stud may be turned in the opposite direction by applying the wrench on the nut B.—Contributed by Chas. T. Richards, Philadelphia, Pa.

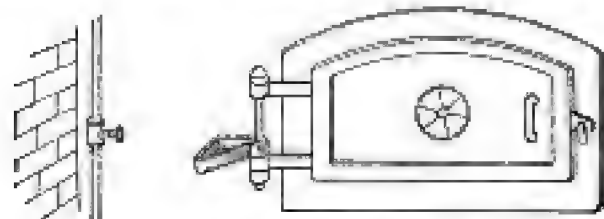


Protecting Switchboards When Drilling Them

Switchboard makers using hand drills for making odd holes will avoid marring the finished surfaces of the slates by slipping a cork on the drill against the chuck. This will serve as a cushion when the drill breaks through the slate.—Contributed by Edward Miller, Rochester, N. Y.

A Furnace-Door Buffer

In the accompanying illustration is shown a triangle hung on a rod that carries the furnace door on a boiler



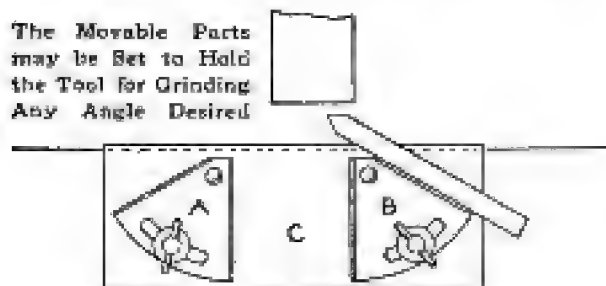
The Triangle Hung on the Hinge Pin Prevents the Door from Striking the Valve in the Pipe

front, and serves the purpose of keeping the door from swinging too far back. In our case, says a correspondent of Power, the drain pipe from the water column was run down a wall, but in the way of the door. The triangle was used to protect the pipe.

Gauge for Grinding Threading Tools

The usual method of holding a lathe threading tool in the hands while grinding it will not always result in getting the proper angle. The emery-wheel rest is of some assistance, but I find that the rest attachment shown in the sketch aids a beginner in grinding a perfect angle. The angle pieces A and B are each pivoted to the base C, which has a projection shown by the dotted line to fit over the edge of the rest. The pieces A and B have a slot cut as shown for adjustment. These slots are fitted with bolts pass-

The Movable Parts may be Set to Hold the Tool for Grinding Any Angle Desired



ing through the base C. Thumbnuts are provided for making the adjustment quickly.

Each edge of the parts A and B is turned up at right angles to form a

surface for the tools being ground. The tool is placed as shown and the whole moved back and forth across the face of the emery wheel while it is turning.

The thumbnuts and slots provide a way to set the tool for grinding any angle desired. The pieces may be set with the aid of the protractor.—Contributed by F. G. Marbach, Cleveland, Ohio.

Grip on a Hammer Handle

Before using a new hammer I have always found it to advantage to cut one or two inches off the end of the handle and then round it well to keep the wood from splitting. If the hammer is to be used on greasy work, it is a good plan to grind a groove $\frac{1}{8}$ in. deep for each finger on the under side of the handle. This will make a grip



Notches for the Fingers are Cut or Ground In on the Under Side of the Handle

for holding the hammer firmly.—Contributed by J. H. Maysilles, Rochelle, Illinois.

Cleaning Glass Gauges

One way of cleaning out the iron rust and calcium deposit in the glass tubes of water gauges on steam boilers is to use the following compound: An ounce of common soda is mixed with 3 or 4 oz. of vinegar and the glass tubes washed out with it. This compound is also good for removing flyspecks and grease spots from all glass articles. For grease it works better if a little salt be added to the solution.

The ingredients are cheap and the mixture harmless. The vinegar and soda should be mixed in a wide-mouthed jar, as otherwise the foaming will cause the solution to run over. As soon as the foaming ceases, the solution may be placed in smaller bottles for future use.—Contributed by Loren Ward, Des Moines, Iowa.

How to Make a Slide-Wire Bridge

By A. E. ANDREWS

The slide-wire bridge is a device for measuring the value of an unknown resistance in terms of a known resistance. The bridge in its simplest form is nothing else but a divided circuit, and its operation can be easily understood by studying the relation between the current through, and the drop in electrical pressure over, the various parts of a divided circuit.

Two unequal resistances, AB and CD, are shown connected in parallel in Fig. 1, and this combination is then connected in series with the battery through the switch E. The drop in electrical pressure across the upper branch AB of the divided circuit is equal to the drop across the lower branch CD, when the switch E is closed, and this drop remains constant provided there is no change in the pressure supplied by the battery. The drop in pressure over a certain part of AB, say, of a resistance of one ohm, is not the same as the drop over a like portion of CD, because the current in the two branches is not the same, due to their being of unequal resistance.

Assuming that the current passes through AB and CD in the direction indicated by the arrows in Fig. 1, then the right-hand end of the two branches will be at a lower pressure than the left-hand end, and any point on AB to the right of A, and any point on CD to the right of C will be at a

on CD, as point G, can be found between which and the point C there will also be a difference in pressure of two volts. The point G on CD can readily be found by connecting one terminal of a galvanometer to the point F and moving the other terminal along the branch CD until there is no

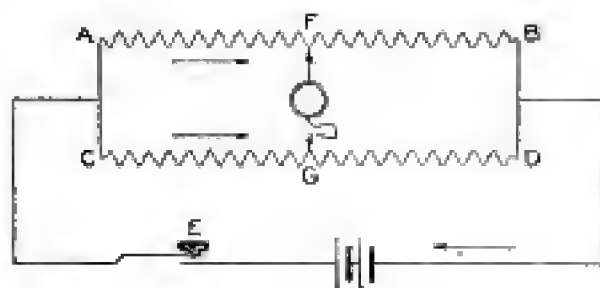
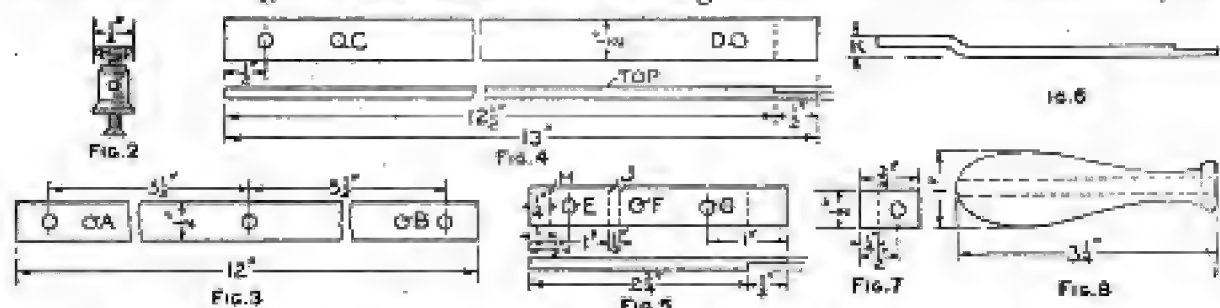


FIG. 1

Diagram of Two Unequal Resistances Which are Connected in Series with a Battery

deflection of the galvanometer needle when its circuit and the switch E are both closed.

When there is no deflection of the galvanometer needle there is no current through it, and, hence, the two points F and G, to which it is connected, are at the same potential. These two points may be connected by an electrical conductor and there will be no flow of current in the conductor, nor will the current in any part of the circuit be disturbed by connecting the two points. When a balance of the galvanometer is thus obtained, the



Details of the Parts for the Construction of the Slide-Wire Bridge. The Parts may be Made of Brass or Copper Cut to the Dimensions Given

lower pressure than the left-hand ends. If a point on the upper branch, such as F in Fig. 1, be selected, it will be lower in pressure than point A, say, two volts, and a corresponding point

drop in pressure over AF is equal to the drop over CG, and the drop over FB must therefore be equal to the drop over GD. The ratio between the drop over AF and FB is the same as the

ratio between the drop over CG and GD. The current in both parts of the upper branch is the same, as there is no current through the galvanometer circuit, so that, as a result, the same relation exists between the two resistances AF and FB as exists between the drops over them. The same holds true for the lower branch, when there is no current through the galvanometer, and we can say the resistance AF is to the resistance FB as the resistance CG is to the resistance GD.

This statement written in the form of an equation will appear as follows:

$$\frac{AF}{FB} = \frac{CG}{GD}$$

or it may be written in the following form without changing its numerical value

$$\frac{AF}{CG} = \frac{FB}{GD}$$

For example, if the resistance in CG is 4 ohms, the resistance in GD is 12 ohms and the resistance in AF is 3 ohms, when a balance is obtained, then the resistance in FB must be 9 ohms because it must bear the same relation to AF, as GD does to CG. This relation of resistances required to give a balance of the galvanometer, makes it possible to measure an unknown resistance, such as FB, in terms of the resistance AF by moving the galvanometer connection along the branch CD until a balance is obtained. After a balance has been obtained, the values of the three resistances AF, CG and GD can be substituted in either of the above equations, and the resistance of FB determined.

In what is termed the "slide-wire bridge," the resistances CG and GD are nothing more than a piece of wire stretched between two binding posts. The point G is a sliding contact arranged so that it may be shifted from one end of the wire to the other. Now, if this wire be of uniform cross section, the same relation will exist between the resistances of various portions of it, as between the lengths of these respective portions. In the operation of

the bridge, the relation between the resistances CG and GD is expressed in terms of the lengths of wire between the points C and G, and G and D. Hence in order to determine the value of the unknown resistance, such as FB, it is only necessary to know the value of the resistance AF. The resistances CG and GD are called the "ratio arms" of the bridge because the relation between them is the relation between the known resistance AF, which is called the "rheostat" of the bridge, and the unknown resistance FB. The ratio arms are usually designated by the letters A and B, the rheostat by the letter R, and the unknown resistance by the letter X.

A simple slide-wire bridge may be constructed as follows: Procure a piece of well-seasoned hard wood that is to serve as a base for the bridge, 44 in. long, 6 in. wide and $\frac{7}{8}$ in. thick. Dress both sides of this board with a smoothing plane, round off the corners on one side, and sandpaper it until perfectly smooth. Then give the board at least three coats of shellac, allowing each coat ample time to dry. It would be best to rub the surface with a piece of very fine sandpaper after the first and second coats have thoroughly dried. If the wood used has an open grain, it should be given a coat of wood filler before being shellacked in order to give the best results.

The electrical connections on the bridge should be of low resistance, so that they will introduce only a very small error in the measurements, and for this reason must be made of a material having a rather low resistance and should have a large cross section. Obtain a piece of brass or copper, approximately $\frac{1}{8}$ in. in thickness, $\frac{1}{2}$ in. wide and about 48 in. long, also ten back-connected brass binding posts similar to the one shown in Fig. 2. Cut from the strip of brass or copper a piece 12 in. long. Drill three holes in this piece, one in each end and one in the center, as shown in Fig. 3, to be used in mounting three binding posts. Drill two other holes, A and B, to be used in mounting the strip on the

wooden base, which will be described later. Cut off two other pieces 13 in. long. File away part of one end of each of these pieces as shown in Fig. 4. Drill a hole for a binding post in

should now be soldered to the $3\frac{1}{4}$ -in. pieces (Fig. 5), so as to form two right-angled pieces as shown by L and M in Fig. 9. These should now be mounted on the base by means of

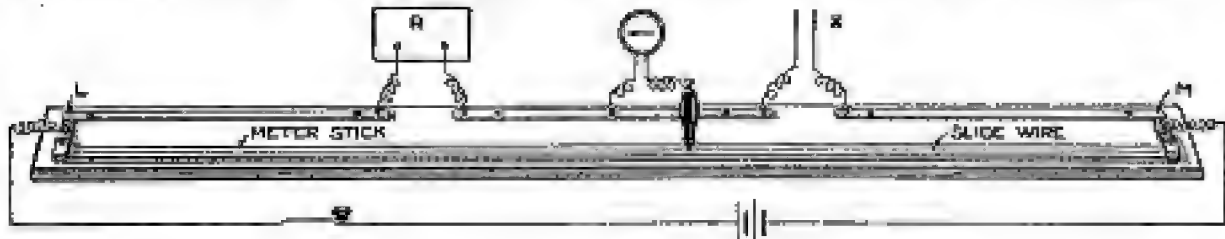


FIG. 9

The Parts as They are Attached to the Base with the Meter Stick and Slide Wire. Connections are Shown for Placing the Unknown Resistance in a Circuit with a Known Resistance to Obtain Its Value

the end opposite the one filed, and drill two holes, C and D, in each piece to be used in mounting. Cut off two other pieces $3\frac{1}{4}$ in. long. File one end of each of these pieces as shown in Fig. 5, so that they will fit into the notch cut in the two pieces just finished. Drill a hole E in the end of each of these pieces, opposite the end in which the notch is cut, and tap it to take a small machine screw. Hole F is to be used in mounting the strip upon the base, and a binding post should be mounted at the hole G. Cut off two other pieces $\frac{3}{4}$ in. long, and drill a hole in each of them as shown in Fig. 7. These holes should be large enough to allow the screws in hole E, Fig. 5, to pass through them. Now cut a very small groove with the corner of a file, across the end of the $3\frac{1}{4}$ -in. pieces on the upper side. The location of this groove is shown by the dotted line H, in Fig. 5. A small groove should also be cut in the two small pieces, as shown by the dotted line in Fig. 7.

Now obtain a good meter stick and mount it on the wooden base with several flat-headed brass screws, countersunk so that their heads are level with the surface of the stick. Take the two $3\frac{1}{4}$ -in. strips, or end connecting strips, and bend them at the dotted lines J, Fig. 5, forming two pieces similar to that shown in Fig. 6. The dimension K in Fig. 6 should be equal to the thickness of the meter stick.

The two 13-in. pieces (Fig. 4)

round-headed screws as shown in Fig. 9. The grooves H should be opposite the centers of the ends of the meter stick. Then mount the 12-in. or center connecting strip so that the gaps between its ends and the ends of the corner strips are equal in length.

The slide wire itself should be made from a piece of german silver or manganin wire, as the resistance of such a wire is greater than that of copper wire of equal dimensions and it will stand more mechanical abuse than the copper wire will. There will be required about 42 in. of wire and it should be about No. 22 gauge without any insulation. The wire can be clamped in position on top of the meter stick, and the bridge is complete with the exception of a sliding contact for connecting the galvanometer to the slide wire.

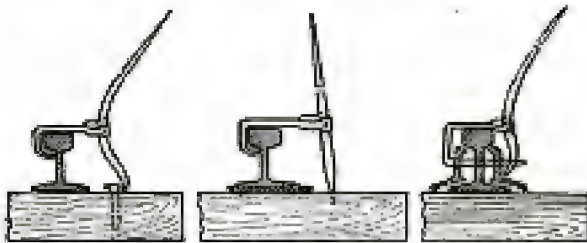
A very simple sliding contact can be made by mounting a piece of brass on a small wooden handle, the electrical connection to the piece of brass being made by means of a small binding post attached to it. The piece of brass should have its edge sharpened so that it will make contact with a definite point on the slide wire. The following description of how to build a simple contact may be of value to some readers. Cut out a round wooden handle similar to that shown in Fig. 8. Drill a $\frac{1}{4}$ -in. hole through this handle lengthwise. Obtain a piece of $\frac{1}{4}$ -in. round brass rod, about $1\frac{1}{4}$ in. longer than the handle. Mount a small bind-

ing post on one end of this brass rod, then shove the other end through the hole in the handle until the base of the binding post is even with the large

end of the handle and fasten it in place. File the projecting end of the brass rod so that it is wedge-shaped, and the contact is complete.

A Bar for Railroad Work

The rail bar shown in the sketch has been found to work effectively and to save much labor as well, says Railway Age Gazette. It is made in three types,



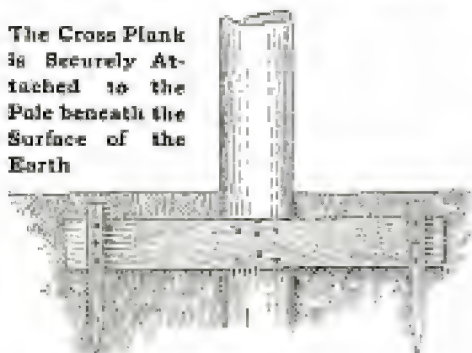
The Three Types of Bars in Use on Rails, Showing Their Application in Each Case

as shown. The bar at the left is used to force the rail into place against the spikes when renewing a rail. The form in the center is used to hold the rail to gauge where tie plates are being applied or where there are no spikes in the ties, while the one at the right is employed to draw the angle bars into position in order that the bolts may be easily applied.

A Brace or Anchor for a Pole

Many times I have been forced to use an anchor and wire to a guy pole on a slight curve. The extra work of putting in an anchor added some little expense to the setting of the pole. After trying different methods to elim-

The Cross Plank is Securely Attached to the Pole beneath the Surface of the Earth



inate the extra cost, I finally succeeded by using the brace shown in the sketch.

After digging the hole for the pole, a trench is dug across it to receive a board or plank. Two stakes are driven in the earth at the ends of the plank, and the plank is securely spiked to both stakes and to the pole. The earth is then tamped in solidly about the plank and pole. This simple anchor will stand considerable strain on the pole at the top. Such an anchor is very appropriate for fences, clothesline poles, telegraph and telephone poles.—Contributed by Harry Fritzinger, Decatur, Ind.

Counterbalancing Rolling Doors

The heavy doors of a carriage house, barn or garage may be so constructed that they will be practically self-opening when the latch is released. A $\frac{1}{2}$ -in. pliable rope is fastened to a staple driven into the top of the outer edge



The Weight as It is Attached to a Door to Counterbalance or Make It Self-Opening

of each door. The rope is then run parallel with the track to the point reached by the edge of the door when open. At this place a rectangular hole is cut in the wall and the rope run over two pulleys so arranged as to turn it in a downward course, as shown by the dotted lines in the sketch.

The weights attached to the ends of the ropes may be just heavy enough to counterbalance the doors or they may be of such a weight that they will draw the doors open when the latch is disengaged.

When the doors are made self-opening they are closed by first drawing one door shut and fastening it with

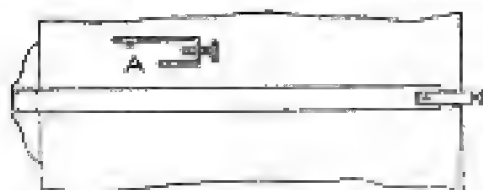
a foot latch, whereupon the other door is drawn closed and both doors latched with the hand latch. The foot latch is then released. A line may be attached to the hand latch and the end extended to some place within the building or outside as desired, so that a pull on the rope will release the latch and allow the door to open.—Contributed by J. G. Allshouse, Avonmore, Pa.

Preserving Extra Door Keys

It often happens that a key for a door is lost and if the extra key cannot be found a new one must be fitted which involves the removing and taking apart of the lock. New locks are always supplied with two keys and if the extra keys for all doors are kept together no trouble will be experienced when a key is lost, but this is seldom the case. A still better way is to have a carpenter, when fitting the new door in its place, cut a small mortise or depression in the top edge of the door just large enough to hold the extra key. Put the key in this place and it can always be found when needed.—Contributed by Bert R. Libe, Platte, S. D.

T-Square Clamp for a Drawing Board

Where it is necessary to hold a T-square in one position on the drawing board for any length of time, the clip A, shown in the sketch, is a good device to clamp it perfectly horizontally across the board. The clamp consists of a piece of steel, $\frac{1}{4}$ by $\frac{3}{4}$ by $4\frac{1}{2}$ in. The metal is bent into U-shape, with one leg longer than the other, and fitted with a screw and pin, as shown.

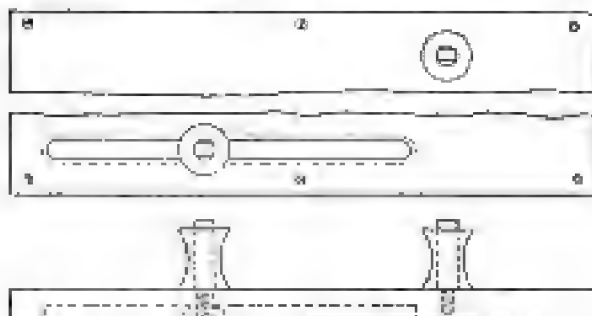


The Shape of the Clamp and Its Application to a T-Square and Drawing Board

The clamp is easily applied to the T-square.—Contributed by Egner Christensen, Montrose, Iowa.

Pipe-Bending Rolls

The pipe-bending device shown in the sketch is made as follows: The flat base plate is made of cast iron, 10 in. wide by 18 in. long and $1\frac{1}{2}$ in.



The Cast-Iron Base Carries Two Rollers, One Stationary and the Other Adjustable

thick. A slot, about $\frac{7}{8}$ in. wide, is cut into the plate and recessed at the bottom so that a nut will slide in it. The roll-holding studs are made of $1\frac{1}{4}$ -in. steel, turned down at one end to $\frac{7}{8}$ in. to fit through the slot and also to screw into the plate and the nut respectively. The other end is filed square for turning with a wrench.

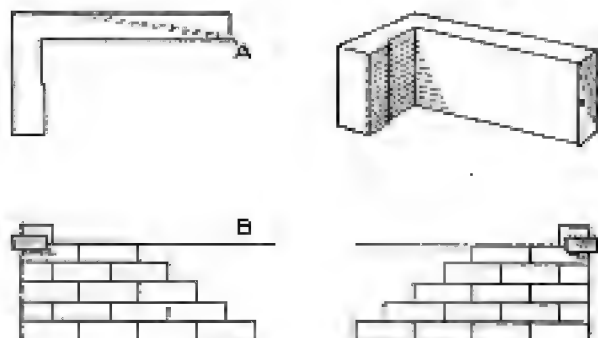
The rollers are of cast iron, bored to a loose fit on the studs and turned concave on the surface to fit a 2-in. pipe. This size of rollers will bend pipe from 1 to 2 in. in diameter without kinking the metal. For pipe smaller than 1 in., another set of rollers must be made to fit a 1-in. pipe. The whole device can be fastened to a bench with large screws. The adjustable roller makes it possible to bend pipes in many different curves.—Contributed by Geo. Hauley, Newburg, New York.

Removing a Damaged Round-Head Screw

When asked to remove a number of round-head screws from the timing-gear case of a motorcycle, I found that the slots in the screw heads were in bad shape, so much so that they could not be removed with a screwdriver. I filed two sides of each screw head flat so that the surfaces were parallel, and removed the screws with a pair of pliers.

Line Holder for Bricklayers

In building a wide chimney or mantel a bricklayer attaches the string used for keeping the work straight to



The Line Stretched Tightly Between the Blocks Keeps Them in Place on the Bricks

nails that are pushed into the mortar between bricks. The illustration shows a very convenient way of holding the string without nails. Two wood blocks are cut as shown and a hole, A, bored on an angle to receive the end of the string. A block is placed on each end of the string and fastened so as to draw the string tightly when in place on the work. The string B is held tightly when the blocks are slipped on the corner bricks.—Contributed by C. R. Poole, Los Angeles, Cal.

A Multiple-Battery Box

The main feature of this box is the connections on the cover. The box is of a size to hold four dry cells and when the cover is fastened down all

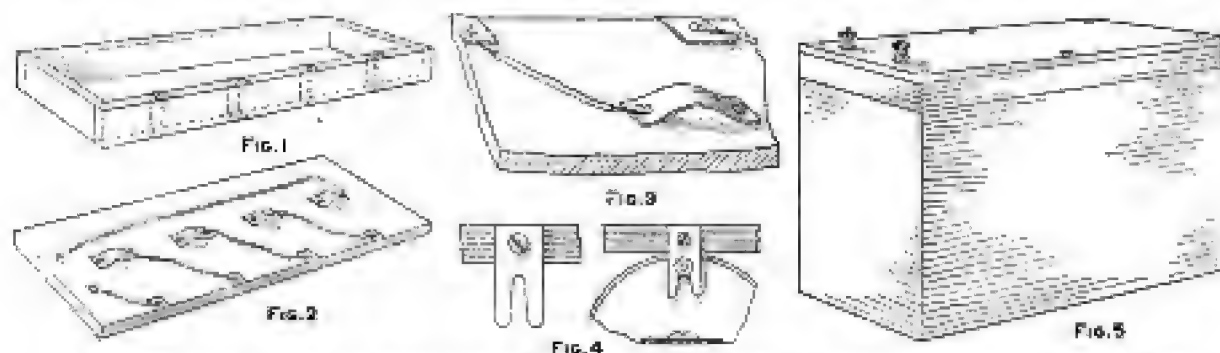
shown in Fig. 1. These copper strips, when the cover parts are fastened together, form connections which are attached in multiple as shown in Fig. 2. Each piece at the edge of the cover is connected to a strip of copper, centrally located on the board, as shown in Fig. 3.

When the cover is closed, the strips of copper (Fig. 1) come in contact with the U-shaped pieces fastened with screws to the box sides, as shown in Fig. 4. The binding post attached to the zinc of a cell is slipped into the U-shaped piece and fastened. The middle strip of copper on the cover (Fig. 3) comes in contact with the carbon top of the cell. The complete box is shown in Fig. 5.

The cells are easily fastened to the U-shaped pieces (Fig. 4), and when the cover of the box is closed, a complete circuit is formed with the binding posts on top (Fig. 5) for connection to the system where the battery is to be used.—Contributed by Edwin Marshall, Oak Park, Ill.

Lustrous Black on Brass

Dissolve freshly precipitated carbonate of copper, while moist, in strong liquid ammonia, says Metal Industry, using so much of the copper salt that a small excess remains undissolved or, in other words, that the ammonia is saturated with copper. The method recommended for preparing the carbonate of copper is to mix hot solu-



The Connections are So Arranged on the Box Cover That When the Cells of Battery are in Place the Closing of the Cover will Form Connections to the Outside Binding Posts

the cells are connected to the binding posts. Four strips of copper are attached to the skirt of the cover, as

tions of equal parts of blue vitriol (sulphate of copper) and sal soda (sodium carbonate), filtering off and washing

the precipitate. Dilute the solution of copper salts in ammonia with one-fourth its volume of water, add 1 oz. of black lead, and heat to about 100 deg. F. To prepare the work, cut down on a hard wheel, wash out in a potash solution, and run through the solution described until the article becomes black.

Setting Lathe to Cut Standard Tapers

On lathes not having the standard tapers marked in thousandths of an inch it is necessary to determine the correct position of the tool in reference to the piece cut. A quick way to determine this is to place a drill or sleeve having the desired taper in an end-reversed position as shown, and caliper



A Piece Having the Desired Taper is Placed Against the Piece being Cut and Both Ends Calipered

the two ends. The end having the largest measurement must be thrown nearer to the cutting edge. This should be done as soon as one full cut has been taken over the work.—Contributed by Jas. S. Frear, Sidney, New York.

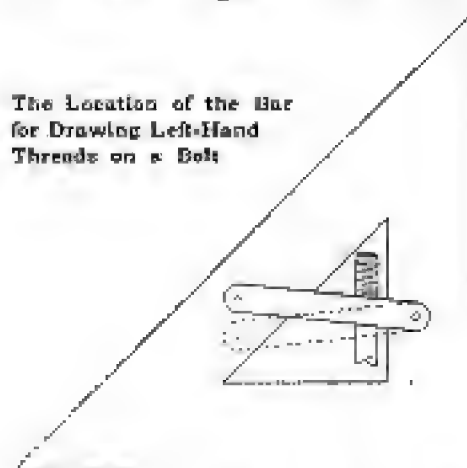
Soft Solder for Tightening Machine Parts

It is not generally considered workmanlike to use soft solder in connection with machine parts, but an exception may be made in tightening up the parts of loose fixtures. For example, if the driving gear on the spindle of a lathe is so light that it does not afford a good support for the key, the gear, key and spindle may be tinned and heated sufficiently to melt the solder which sweats the parts solidly together and holds the gear firmly in its place. Such a job will last almost as long as the various parts and will save all the lost energy and wear that accompany loose, rattling machinery.

Triangle for Drawing Threads

A centerline is drawn on an ordinary triangle and a bar pivoted on the line at the lower edge. Two holes are

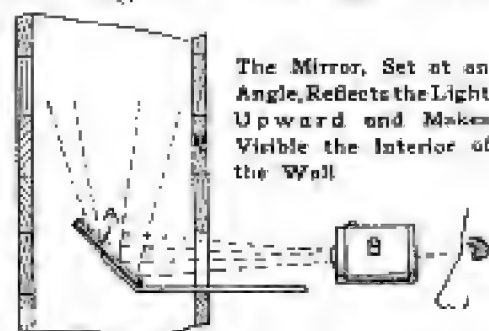
The Location of the Bar for Drawing Left-Hand Threads on a Bolt



drilled on the upper part, 4 deg. on either side of the centerline. A pin is stuck through the bar and triangle to hold them together, and the position of the bar is changed according to whether right or left-hand threads are to be drawn.—Contributed by J. F. Tholl, Detroit, Mich.

How to Examine the Interior of Open Walls

A very simple and effective way of investigating the interior of an open wall or partition which would ordinarily be inaccessible is shown in the accompanying illustration. This simple use of a small piece of mirror, A, mounted on a specially constructed handle together with an ordinary



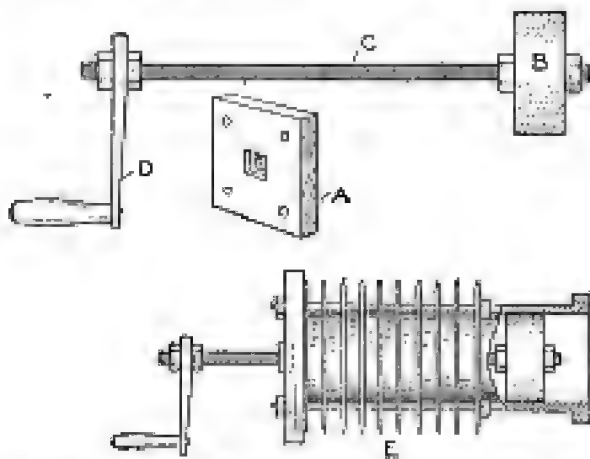
The Mirror, Set at an Angle, Reflects the Light Upward and Makes Visible the Interior of the Wall

pocket flash lamp, B, is a great labor-saving device in inspecting electric wiring and plumbing. The mirror is introduced into a small opening, the lamp and the observer's eye being in a position similar to that shown in the

sketch. The light from the lamp is reflected from the mirror upon the place to be illuminated and at the same time the image of the object or wall is reflected back to the eye.

Truing up the Bore in Motorcycle Engines

Most repairmen whose shop is not equipped with the proper tools, will find it a most difficult job to bore true a motorcycle cylinder that is worn a little out of round or has carbon or



Boring by a Hand-Turning Grinding Head, Temporarily Attached to the Cylinder

sand scratches on the walls, causing a loss of compression.

It is very easy, however, to true up such cylinders with the use of a homemade grinding device as shown in the sketch. The device is constructed as follows. Procure a hardwood block, A, slightly larger than the outside diameter of the fins on the cylinder, and lay out the bolt holes of the head on the block. Drill the holes about $\frac{1}{4}$ in. larger than the cylinder bolts. Drill a $\frac{1}{2}$ -in. hole in the center and with a chisel cut a square hole $\frac{1}{4}$ -in. deep for the feed nut. Turn up a hardwood block, B, 2 in. thick, the exact size of the bore and drill a $\frac{1}{2}$ -in. hole through its center. Procure a piece of shafting, about 3 in. longer than the cylinder, also five $\frac{1}{2}$ -in. square nuts and four bolts the size of the cylinder bolts, or a trifle smaller, and as long as the entire number of fins plus the thickness of the block A.

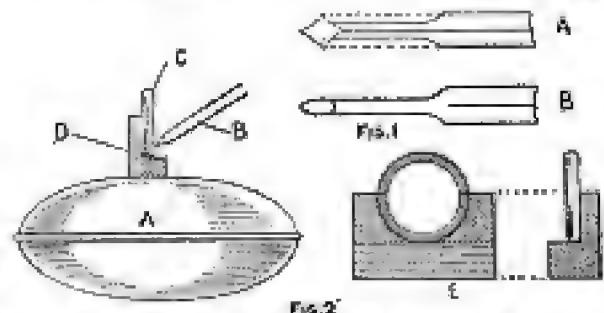
The grinding block B is fastened to

the end of the screw by means of two $\frac{1}{2}$ -in. nuts. Fasten the block A to the cylinder as shown at E, and place the nut on the screw in the square hole cut in the center of the block A. Fasten the nut to the block with nails. A crank, D, is attached to the outer end of the screw with two nuts.

Fine emery and oil are applied to the surface of the wood block B and cuts are taken by turning the screw back and forth in the cylinder. As the turning proceeds, the oil-soaked block will swell slightly and become of sufficiently increased size to do the grinding. After two or three cuts are taken, rinse out well with gasoline.—Contributed by Joe V. Romig, Allentown, Pennsylvania.

Engraving on the Inside of Finger Rings

The square graver, ground as shown in Fig. 1, is recommended by the author of "The Art of Engraving," as the correct tool for engraving the inside of rings. A represents the graver in its ordinary form, and B as ground for this purpose. The object of grinding a graver in this shape is, that when the graver is thrown out, or when it is curved around to the right or to the left to complete a loop, coming in contact with the edge of the ring will not mar it; and also so that it can get just as much nearer the completion of a loop in making



The Shape to Grind Engraving Tools and the Manner of Holding the Rings While Doing the Work

the curve to the right or the left as the amount that has been cut off from the sides. A graver ground in this shape can be used inside the average width of oval wedding rings to make

any loop or even to cross a T or make the bottom of an L.

Students in the art of engraving often practice inside-of-ring work by placing the ring in a holder, which is furnished with some makes of engraving blocks. Beginners should dispense with all such devices. Very few, if any, good engravers hold a ring in any other way than in their hand and on the sandbag pad when cutting it. At Fig. 2 are shown the pad, A; graver, B; ring, C, and block, D. The little block shown at D, a side view of which is shown at E, is made of soft wood about 1 in. long, and other proportions accordingly, with a semicircular opening in the top to admit light on the work. When engraving inside a ring with the aid of this block the operator would look in the direction the engraving tool B, Fig. 2, points. The little block of wood is so near the size of the ring that the thumb and finger pressing down against the edge of it will also strike against the ring. The object of using this block is to hold the ring more securely by increasing the amount of friction on the pad. The graver is shown at B. It works, of course, in the opposite direction from the point of vision. A little block of this description will suffice for holding any size ring, and a great many engravers find it helpful, but with a little practice little trouble will be experienced in cutting the ring directly on the pad, holding it between the thumb and index finger of the left hand.

A Paste to Use in Damp Places

Use good wheat flour, dampen and beat smooth, then add boiling skimmed milk instead of boiling water, and stir into the flour. After the paste is cold, thin with water and strain it. This paste can be used with good results in damp places.—Contributed by Fred L. King, Islip, N. Y.

A fine brass-wire mesh placed over the air inlet of the carburetor and breather pipes, will keep out a large portion of the grit and dirt.

Flowing Chemicals by Suction

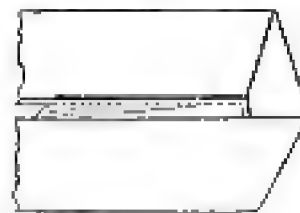
It is sometimes both disagreeable and dangerous to use a pipette in the ordinary manner for the purpose of moving measured quantities of some solution from one container to another in the laboratory.

The sketch shows an apparatus by means of which the pipette may be filled at a safe distance from the fluid, to be sucked into the pipette, whether this fluid be of such a nature that it would cause injury if sucked into the mouth, or its fumes be disagreeable or noxious. The construction and operation of the apparatus is self-explanatory. A valve or stop can be placed in or on the tube for regulation if desired.



Glass Bottom for a Cake Pan

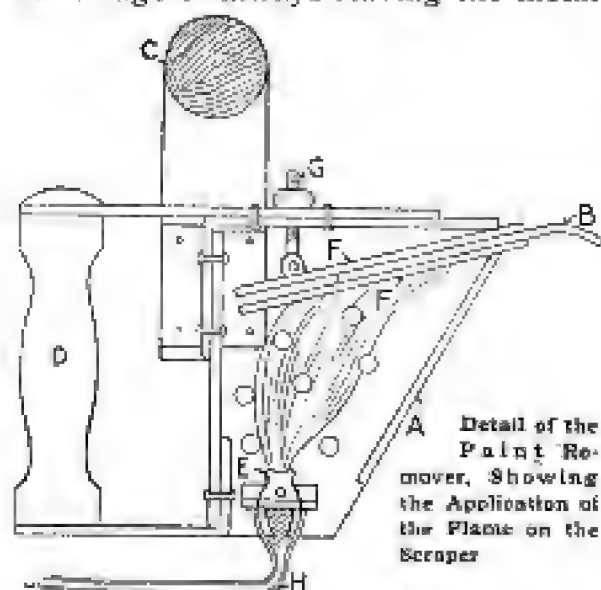
Cut out the bottom in an ordinary pan, leaving about $\frac{3}{8}$ in. of the metal around the edges. Cut a piece of glass the size of the bottom in the pan and grind the edges to prevent cutting the hands. The glass bottom in the pan makes it easy to examine the cake while it is baking. After trying out this method, we found it much more satisfactory than the old way.—Contributed by W. Crane, Cleveland, O.



To Remove Paint or Enamel From Metal

For the removal of paint or enamel from large metal surfaces, for which work either the blowtorch or a special chemical lye is usually employed, unless a sandblast is available, a method

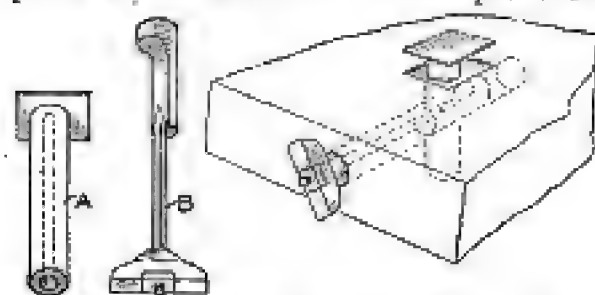
is recommended by a German technical magazine which is said to offer the advantage of always leaving the metal



surface uninjured and in suitable condition for a new coat of paint. It also is less messy than other processes; develops no fumes, and may be carried on at any place in a factory and by unskilled workers. It consists simply in using a heated scraper. In the accompanying illustration A represents the sheet-iron boxing; B, the scraper; C and D, the handles for operating the tool; E, a gas-flame jet; F, guide irons for holding the scraper; G, a screw and nut for adjusting the angle of the guide irons; H, a flexible tube to the gas supply. Holes are cut in the side for ventilation.

A Homemade Bench Stop

An easily operated stop for a workbench is made as follows: The main piece A, consists of a round piece of



wood, 1 in. in diameter and 4 in. long, through the center of which passes a

rod with a piece of saw blade riveted to the top end and a washer on the bottom.

The part B is a $\frac{3}{8}$ -in. bolt, 6 in. long, with a round piece of wood shaped as shown on the head end, and a thumb nut for the threads. Two holes are bored into the bench top to receive these parts. The illustration clearly shows how they are used.—Contributed by A. S. Thomas, Gordon, Ont.

Finding the Contents of Concrete Walks

The contents of concrete walks and the amount of cement, sand and gravel necessary to the cubic yard may be found by using the following rule: The width of the walk multiplied by its length, both measured in feet, equals the surface. The surface multiplied by the depth in inches and divided by 12, gives the total contents in cubic feet. The number of cubic feet divided by 27, equals the cubic yards of material in the body of the walk.

For example, find the surface and cubic contents of a walk 5 ft. wide, 100 ft. long and 4 in. thick.

$5 \times 100 = 500$ sq. ft. of surface.
 $500 \times 4 = 2000 \div 12 = 166\frac{2}{3}$ cu. ft. in the body of the walk.
 $166\frac{2}{3}$ cu. ft. $\div 27$ cu. ft. = 6.17 cu. yd. in the body of the walk.

The amount of the various materials may be ascertained by the following method. Add together the numbers indicating the proportions of the materials to be used in the mixture, and divide 40 by this sum. The quotient will equal the number of 100-lb. bags of cement needed for each cubic yard. The number of sacks of cement multiplied by the number of parts of sand and gravel will give the number of cubic feet of each per cubic yard.

For example, the mixture is to be 1 part cement, 2 parts sand and 4 parts gravel. The sum of these three is 7.

$40 \div 7 = 5.71$ bags of cement to each cu. yd.
 5.71×2 , proportion of sand = 11.42 cu. ft. of sand per cubic yard.
 5.71×4 , proportion of gravel = 22.84 cu. ft. of gravel per cu. yd.

—Contributed by Geo. M. Petersen, Buffalo, N. Y.

Magnetized Tack Puller

Magnetize the tack puller by rubbing it on a horseshoe magnet, or by wrapping several turns of insulated wire around it to form a coil and attach a battery to the ends of the wire and allow the current to pass through the wire for several minutes. A magnetized tack puller will hold the tack and prevent its being thrown from the board.—Contributed by Theo. A. Oberhellmann, St. Louis, Mo.

An Account Counter

The total number of accounts in a banking business must be counted and tallied occasionally, as well as the number of checks, which is a tedious task. The time of doing this may be greatly reduced by using the little device shown in the sketch. Figures from one to one hundred were printed on a strip of paper by using the adding machine and the paper trimmed close to the figures. The strip was then pasted on the back of a ruler. The ruler placed on an account easily indicates the number of checks written.—Contributed by Maurice Baudier, New Orleans, La.



A Wood-Screw Lock

It is sometimes desired to so set a common wood screw that removing it is made very difficult if not impossible.



One way of doing this is to drill a small hole at an angle through the head and body of the screw as shown in the sketch and driving a brad through the hole and into the wood. If the hole in the screw head is countersunk to allow the head of the brad to sink flush with the bottom of the slot, it becomes practically an impossibility to remove the screw.—Contributed by R. F. Pohle, New Haven, Conn.

To Prevent a Spring from Slipping

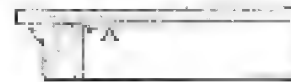
Quite often it is almost impossible to keep automobile springs, and especially those on the front axle, from slipping on the axle, no matter how tightly the clamps are drawn. This can be overcome by cutting a piece of spring the same width as the automobile spring and just long enough to fit snugly between the clamps and fastening it in place with the same bolt that passes through the spring.



The piece of spring rests against the clamps on either side and prevents the spring from shifting on the axle in case the clamps come loose.

Protecting Sills from Rot

While repairing a decayed sill under the porch of an old house I found a strip of asphalt roofing covering the top of the sill for about 4 ft. The covered part of the sill was perfectly sound. When the new sill was in place, it was covered with a strip of two-ply asphalt roofing as shown at A in the sketch.



Any sill or part of a building that is exposed to dampness or located in a place where it is liable to rot can be effectively protected in this manner.—Contributed by Geo. Monson, Deposit, New York.

A Tool-Check Ring

An effective substitute for a key or tool-check ring can be made by selecting a cotter of suitable size and spreading the parts until the two ends meet as shown in the sketch. This makes a strong ring.



—Contributed by A. Clifton, Chicago, Illinois.

Various Methods of Fitting Hinges

The three types of hinges shown in Fig. 1 are those most commonly used. They may vary in size and details, but not very much in their proportions, says *Building News*. The shape of the butt-hinge adapts it for attachment to narrow edges of wood, as those of doors and box-covers. The length of its pivot or knuckle is greater than the extension of its flaps.

In the back-flap hinge these proportions are reversed, the length of the knuckle being less than the measurement across the flaps. This type of hinge is used on broad surfaces, and chiefly for a rougher class of work than butts.

The tee-hinge is used similarly, its extremely long extension serving as a brace and stiffener to a broad surface of comparatively thin wood.

The butt-hinge, Fig. 2, is generally sunk into the wood, but not necessarily so. As far as hinging of the parts is concerned, the effect is the same, whether it be screwed on the outer surface, as in Fig. 3, or inside of the joint, as in Fig. 2, but a back-flap hinge is more suitably proportioned for such a position.

When a butt-hinge is used, as in Fig. 2, long screws can be inserted, and there is no risk of their tearing out, or of the wood breaking away. If it is attached as in Fig. 3, the screws are rather close to the edge, and the strain on the hinge tends to split the wood. For this reason a back-flap, or a tee-hinge, as in Fig. 4, is preferred for attachment to the outer surface. The former is occasionally sunk flush with the surface, but the latter never is, being simply adjusted in the required position and screwed on.

The butt-hinge, used in Fig. 2, must be sunk, in order to make a close joint between the hinged parts, but when the hinge is placed as in Figs. 3 and 4, its thickness does not interfere with the closeness of the edge joint, but only with the closeness of the broad surfaces, when they are folded back against each other.

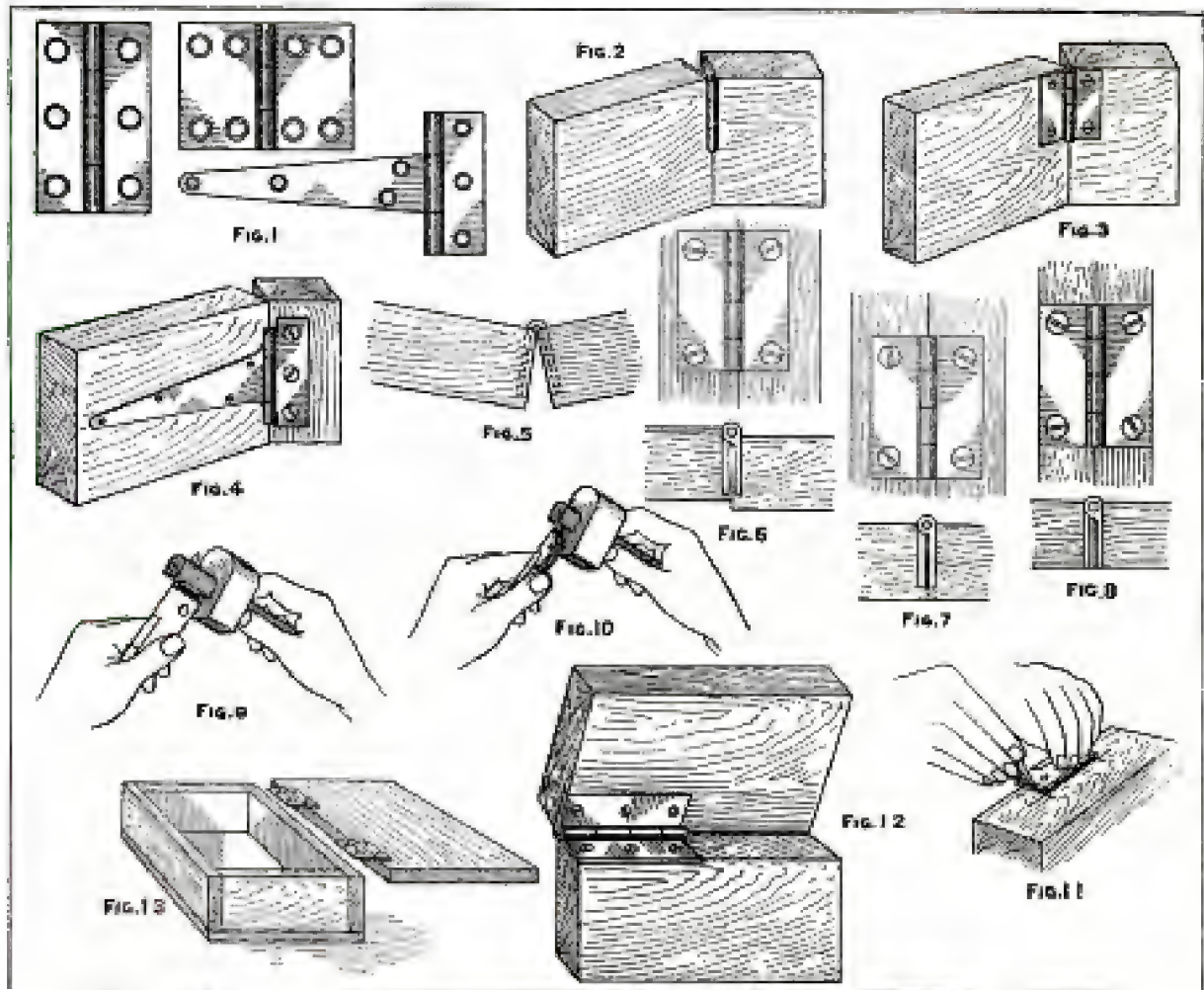
Generally it is easier and quicker to attach a hinge as in Fig. 3 than in Fig. 2. The parts to be hinged simply have to be placed in position, with their edges in contact, and the hinges screwed on, care being taken to set their knuckles central over the joint. In many cases the parts can be laid flat on a bench while this is being done.

If the hinges are to be sunk flush with the surface, they are laid in position, lines marked around them, and the recesses chiseled out to correspond with the thickness of the flaps. Then the hinges are inserted and fastened with screws.

In attaching butt-hinges, as in Fig. 2, the procedure is not quite so simple, for the parts can seldom be placed as conveniently. The hinges must be fitted to one of the parts first, and this held in position for attachment to the other.

Hinges must be sunk to exactly the right depth or the joint will either be open, or it will bind and not close properly. This latter defect is shown in Fig. 5. The hinge shown is sunk too deeply, and the edges of the wood, at the knuckle, bind and prevent the farther edges from coming into contact. The joint might be closed completely by the use of force, but it would spring open again as soon as released. The remedy is to take the hinge off and replace it with cardboard packing beneath, or plane the wood down to reduce the depth of the hinge recesses.

Another defect is shown in Fig. 6. This hinge is sunk correctly, but is out of center. In the view showing this hinge open, the center line of the knuckle is to one side of the joint. The consequence is that the surfaces of the parts are not flush with each other when the hinge is closed. Butt-hinges attached correctly are shown in Figs. 7 and 8. In Fig. 8, the hinge is the full width of the wood, in Fig. 7 it is less, and the recesses are, consequently, not cut fully across. The neatest and most frequent method is shown in Fig. 7, but when the wood is



Hinges and Their Application to Box Covers, Cabinet Doors and House Doors.
Defects and Their Remedies and Manner of Gauging

thin the hinges sometimes have to correspond with it, as in Fig. 8.

In other cases, where thin wood is hinged to a thicker piece, a combination of methods is followed, one flap of the hinge extending the full thickness of the wood, and the other having wood extending beyond it.

The flaps of a hinge have to be sunk slightly more than their thickness, in order that the wood may make a close joint when the hinge is closed. This is because the flaps are always made thinner than half the diameter of the knuckle.

When a hinge is closed, with the flaps parallel, there is a space between them about equal to the thickness of one flap. This space must exist when the hinge is fitted, but the wood should form a close joint, as shown in Figs. 7 and 8.

The correct depth for the recesses is marked on the wood with a gauge, which is set as in Fig. 9, to the center of the knuckle. When this has been gauged on the wood, the measurement in the other direction is taken, as in Fig. 10, from the outer edges of the flaps to the center of the knuckle. The length of the hinge is marked, as in Fig. 11, by laying it in position on the wood.

When hinges are simply screwed onto the surfaces without being let in, no gauging or marking is necessary, except measuring with a rule to get the distances uniform. They are placed in position, screw holes bored with a bradawl and the screws inserted.

Box covers are hinged as shown in Fig. 12, one flap of the hinge being on a narrow edge and the other on a broad surface. In this case also there is the

alternative of putting the hinges on the outside, instead of in the joint, but the latter is the neatest and the usual way.

The hinges are put on the lid first, as in Fig. 13, and this is held in position, first for marking the lengths of the recesses in the box and finally for screwing on the hinges. It is better to complete the fitting of the hinges to the cover before marking their position on the body of the box, though the lines of thickness and width may be gauged on both simultaneously.

Doors are treated in the same way, the hinges being put on the door first, which is then supported in position against the post for marking the height

of the hinges and finally for screwing them on. The weight of the door is supported during these operations by wedging it up with pieces of wood beneath. The door should be turned back as far as possible, so that the hinges are wide open, as in the upper views in Figs. 7 and 8. There is no difficulty in attaching it properly.

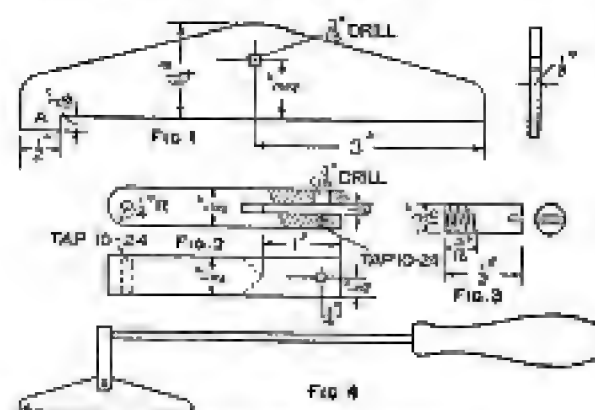
When hanging house doors, an open joint is often allowed, so that the door will open reasonably wide, without binding against the molding of the doorway. The open joint is not made by screwing the hinges on the surface, but is procured by letting their knuckles stand out a little farther when the door is closed.

Magnetic Test for Heat in Hardening Steel

When hardening steel one must know the proper point at which to quench it to obtain the best results. Workmen who do this kind of work regularly, learn to gauge the point of quenching quite accurately, but for the

the carbon in the steel changes from the free to the combined state. Curiously enough, at this same point steel becomes non-magnetic, and by taking advantage of this fact one can harden steel almost perfectly. The ordinary horseshoe magnet is not sensitive enough to show this change, but with the balanced magnet illustrated the point is clearly indicated.

Tool steel is preferable for the magnet, but any steel that will harden can be used. A piece of saw steel, or even an old file ground smooth, can be used. Anneal it and then saw and file to the shape shown in Fig. 1, and drill a $\frac{3}{16}$ in. hole for the pivot, being careful to get the hole perpendicular to the faces. Balance the magnet on a small nail placed through the hole. If it does not balance, take some metal off from the heavier end until it hangs exactly horizontal. If possible, grind the faces parallel and finish it all over. Harden by heating it to a medium red and then quench in water. The metal should be polished, as its movements may then be seen much better in the dim light of the forge. Magnetize the steel by touching it to one of the field poles of a running motor or generator, or wind several hundred turns of fine wire



Detail of the Parts for the Construction of the Tilting Permanent Magnet

amateur, steel hardening presents many difficulties.

A very simple method by which anyone who wants to harden a few tools may obtain as good results as a professional mechanic, though, perhaps, it will take him a little more time, is by the use of a magnet. The temperature at which steel should be quenched to secure the maximum hardness is just above the point where

around it, and pass a direct current through the coil thus formed. Only a moderate degree of magnetization is necessary.

Make the support of brass, $\frac{1}{2}$ in. square. Round up one end and square the other as shown in Fig. 2. Drill holes with a $\frac{3}{16}$ -in. drill and then cut the slot. Tap the holes for a machine screw and ream or drill out the hole on one side of the slot to $\frac{3}{16}$ in. Make a headless screw of $\frac{3}{16}$ -in. brass rod, as shown in Fig. 3, cutting a thread on one end and slotting the other with a hacksaw. Leave it a little more than $\frac{1}{2}$ in. long, so that it can be filed up flush with the hanger when in place. Assemble these three parts as shown in Fig. 4 and see that the magnet is free to swing easily through its entire arc.

A piece of $\frac{3}{16}$ -in. iron rod, 18 in. long, is used for a handle. Threads are cut on one end so that it can be screwed into the upper part of the hanger. An old file handle is driven onto the other end of the rod.

The work is heated to a dull red and the point A of the magnet, held by the handle, is applied to the heated part. If a chisel is to be hardened, it must, of course, be tested near the cutting edge where it is to be hardest. If the magnet sticks to the work, heat a little more and try again. When the work gets to a medium red, it will be found that there is no attraction for the magnet. This means that the hardening point has been reached and passed a little, so the work should immediately be plunged into brine, water or oil, according to the degree of hardness required. If the steel is chipped a little, it will be found to have a very fine grain and is therefore very hard. This method, while not speedy, will produce good results, if care is taken to watch the actions of the magnet.

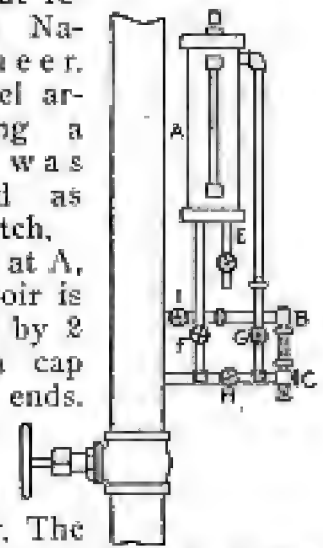
⚡ Back pressure and overheating of an automobile engine is sometimes caused by dirty, soot-filled exhaust pipes. The cut-out gives temporary relief, but a thorough cleaning is the only permanent remedy.

How to Make a Large-Capacity Lubricator

Owing to the huge capacity of a large air compressor, the ordinary hydrostatic pint lubricator was found inadequate without refilling, says the National Engineer. Therefore, a novel arrangement having a large reservoir was made and used as shown in the sketch.

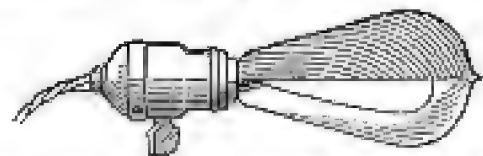
A piece of pipe, at A, for the oil reservoir is 3 in. in diameter by 2 ft. long, with a cap screwed on both ends. The parts B and C are fittings taken from the original lubricator. The filling plug is at D, and E is the valve for drawing off the water when the reservoir A is empty of oil. An emergency valve is located at I.

Glycerine and litharge paste were used successfully to make up the joints to prevent possible leaks, and after giving the outside a coat of japan varnish it presented a neat appearance. To refill, the valves F and G must be closed, but when in operation they are open, and valve H is kept closed.



Shade for an Electric Globe

It is sometimes necessary to have a reflector or shade for an electric light, and where no reflector is at hand a very good substitute can be made by gluing tinfoil on one side of the globe as shown in the sketch. If that part

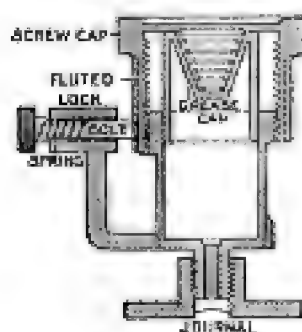


The Tinfoil or Paint is Applied Directly to One Side of the Glass Globe

of the globe which is covered with the tinfoil is painted instead, it will make a shade for the eyes when the light is used about a machine.

Grease Cup for Automobiles

Lubrication by means of grease depends for its efficiency upon the quality of the grease and upon the use of a well-designed grease cup. The illustration here shown, from The Au-

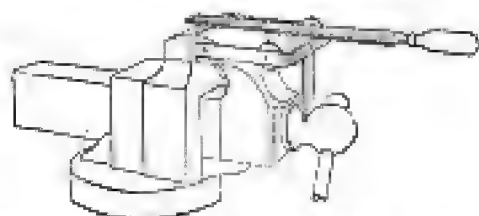


tomobile, is of a special form of grease cup that holds enough grease to make it worth while using a cup, and so made that, by means of a spring which presses against

the supplementary cap, the grease is gently pressed down all the time. In addition to this spring, the cap proper may be screwed down from time to time, thus adding to the pressure exerted by the spring. A lock bolt is located at a convenient point, so contrived that it does not have to be withdrawn when it is desired to screw down on the cap. It affords absolute security, preventing the cap from screwing off or down. This cup, although rather complicated, will effect quite a saving in that no sand will penetrate into the bearings, if it is used.

Vise Guides for Filing Flat Surfaces

When it is desired to file a perfectly flat surface in a vise, the attachment shown in the sketch will greatly assist the filer to that end. The device is made of a strip of iron, about $\frac{1}{4}$ in. thick and 2 in. wide, and bent as



Roller Attachment to Keep the Surface of the File on a Perfect Level

shown. This is fitted with a suitable roller turned from wood and fitted with a steel axle to run freely be-

tween the arms, and the ends of the arms pivoted on pins set in the sides of the outer vise jaw. A metal standard is attached to rest on the vise screw to keep the roller in position. The manner of using the file over the roller is obvious.

Attachment for a Screwdriver

The simple device shown in the cut will be found very useful in starting screws that are hard to reach with the hand. A piece of $\frac{1}{4}$ -in. round steel rod, about 3 in. in length, should be obtained. Saw a $1\frac{1}{2}$ -in. slot in one end of this rod and a $\frac{1}{2}$ -in. slot in the other. This latter should be broad enough to allow two thicknesses of an ordinary alarm-clock spring to enter. Then file the sides of the piece, as shown in the sketch at AA, which will allow them to spring apart and clamp the screwdriver bit. Take two pieces of clock spring, about $1\frac{1}{4}$ in. long, and set them in the $\frac{1}{2}$ -in. slot with a little solder, then bend them as shown in the upper part of the sketch. These springs, when bent together, will catch



The Screw-Holding Attachment Slips on the Blade of a Screwdriver for Starting a Screw

and hold an ordinary screw. The device will be sufficiently strong to drive a small machine or wood screw to the head, while for larger screws it may be used only for starting them.

Casters on Wheelbarrow Rests

Having considerable wheeling to do on a cement sidewalk, for almost one-quarter mile, I found that the task was greatly lightened by attaching a large caster on each post or handle rest. I could set the rests down on the sidewalk and push the wheelbarrow along just as a four-wheeled cart.—Contributed by W. A. Stamaman, Berlin, Canada.



Enlarging Photographs

By A. E. SWOYER

When the photographer wishes to make an enlarged print from a small negative, he arranges a suitable light and condensers back of the negative and by means of a lens projects the resultant image upon a sheet of sensitive paper. Owing to the comparative weakness of the light, however, it is necessary either to use bromide paper or some of the faster brands of de-

sisting simply in the substitution of a better lens for the cheap plate glass with which such instruments are usually fitted.

A contact print, preferably on glossy paper, ferrotyped, is made from the original negative by contact in the usual way; this is then placed in the modified projector and the image thrown upon a sensitive plate of the

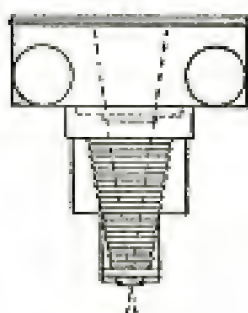


FIG. 1

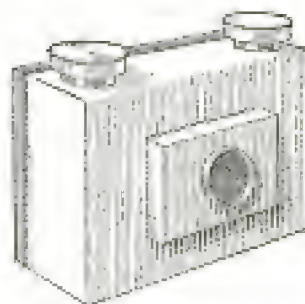


FIG. 2

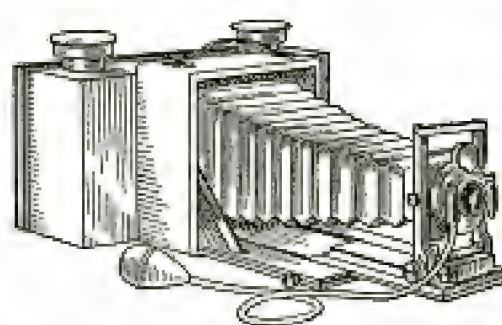


FIG. 3

An Ordinary Post-Card Projector Used Back of a Camera to Illuminate a Photograph Which is Enlarged on a Plate to Make a Negative Instead of a Print

veloping-out paper. If a more artistic medium is desired, a glass positive must first be made and enlarged to produce a negative from which the final prints will be made by contact. This process is somewhat clumsy and expensive, for if any retouching or doctoring is to be done, it must be upon a glass surface, either that of the two negatives or of the intermediate positive. As all of this work is done by transmitted light, there is the loss of fine detail common to all enlargements.

The difficulties incident to this process may be done away with by the use of a modification of the popular post-card projector; the alteration con-

sisting simply in the substitution of a better lens for the cheap plate glass with which such instruments are usually fitted.

The advantages of this process are obvious. In the first place, the comparative cheapness of the apparatus is a factor; in the second, the intermediate glass positive is eliminated, the print which is substituted for it providing a much better medium for retouching, faking or printing in. Transparent water colors in the less actinic shades may be used upon this print to control the final result, and if spoiled, it may be replaced at a negligible cost.

At first glance, it would appear as if

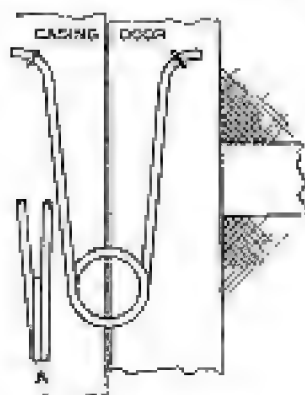
this method were simply a form of photographic copying; it is, in fact, the reverse. For in copying any object with a camera, the sensitive medium is behind the lens and the object to be copied is in front, and the size of the copy is therefore limited both by that of the camera and by its bellows draw. In the reflection process, the object to be copied is back of the lens and the sensitive medium is in front; as large a copy can be made with a small camera as with an eight by ten. It is really more convenient to work with a short-focus lens and a camera of limited bel-

lows extension; the nearer the lens is to the back of the camera the larger will be the projected image.

The diagram (Fig. 1) shows that the size of the object to be enlarged does not depend upon the focal length of the lens used, as in ordinary enlarging, but simply upon the size of the opening in the front of the projector. The dotted lines are drawn from the edges of the card to be projected through the lens. Figure 2 is a sketch of a projector with the lens tube removed, so that it may be used with a camera as shown in Fig. 3.

Homemade Screen-Door Spring

A screen or storm-door spring can be easily made of spring-steel wire.



The wire is bent to the shape shown in the sketch and two turns given to the coil as shown at A. The ends of the wire are fastened to the casing and door with staples. Two or three of these springs

can be attached to one door where it is necessary to have more strength.—Contributed by Wm. Rosenberg, Watertown, Mass.

A Surprise Water Bottle

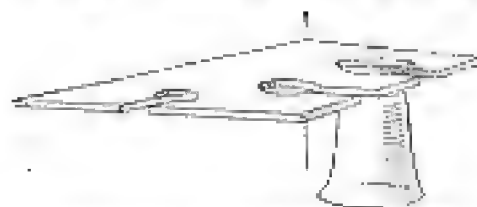
The performer produces a bottle and gives it with a glass to anyone in the audience, asking the person selected to take a drink of a very delicious concoction. When the person attempts to pour out the solution it is found to be frozen.

To perform this trick, the fluid must be previously made with a saturated solution of sulphate of soda and hot water. Fill a clean white bottle with the solution, taking care to cork the bottle while the liquid is hot. The liquid remains in a fluid state as long

as the bottle is corked. When the bottle is shown, it appears to contain a liquid, and in handing it to a person the performer must be careful to take out the cork in time to allow it to solidify. In order to gain the proper time, pretend to be looking for a glass, make some remark about a sudden chill or feel the hand holding the bottle and say it is very cold. In the meantime, the air acting upon the solution has caused it to become fixed and immovable, and when the person attempts to pour it out, he finds it is impossible.

A Graduate Holder

A simple and easily constructed graduate holder in the form of a bracket placed in the corner of a dark room is shown in the sketch. The bracket not only holds the graduates securely, but allows them to drain perfectly and prevents dust settling on



The Graduate Holder is Permanently Fastened in a Corner of the Dark Room

the inside, as they are suspended by the base. Holes of different size are cut in the board to accommodate large, medium and small graduates.

An Alarm for a Sleepwalker

A little girl in our family would walk in her sleep and it caused us no little worry lest she might leave the house without our knowing it. I therefore rigged up an alarm device to ring a bell should she leave the room. The device consisted of a bell and battery in a circuit, and a switch which was attached to one door casing. A string was stretched across the doorway and attached to the switch lever in such a manner as to pull it closed when the string was pushed through the doorway opening. —Contributed by J. Woodburn, Toronto, Canada.

A Kraut and Root Grinder

The grinder is intended mainly for chopping cabbage when making sauerkraut, but it is also of much service in grinding vegetables and roots to be cooked for poultry.

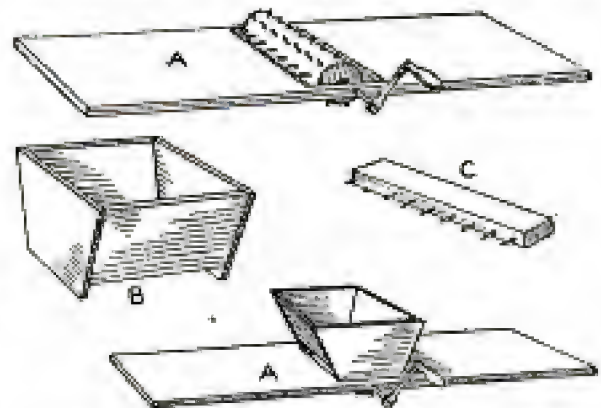
The base A is made of a plank, at least 1 ft. wide and 4 ft. long, with a $9\frac{1}{4}$ by $9\frac{1}{2}$ -in. hole cut in the center. The grinding part, or cylinder, is made of wood, 8 in. in diameter and 9 in. long, with 8-penny nails, spaced $\frac{1}{8}$ in. apart, driven partly into it and then cut off so as to leave $\frac{1}{4}$ in. projecting. The cylinder is turned by means of a crank attached to the end of the shaft.

A hopper, B, is constructed, 4 by $9\frac{1}{2}$ in. inside measurement at the bottom, and as large as necessary at the top. A space is provided at the bottom as shown to receive the concave C, which consists of a 1-in. board, 3 to 4 in. wide and 9 in. long, with nails driven in and cut off as described for the cylinder.

The hopper is securely fastened on top of the baseboard and over the cylinder. The concave is slipped into place and held with wedges or by driving two nails in just far enough to fasten it temporarily. The concave can be adjusted for grinding the different vegetable products, or replaced at any time with a new one.

The ends of the base are supported on boxes, or legs may be provided if

desired. When grinding cabbage, cut the heads into quarters and remove the hearts. Press the cabbage on the



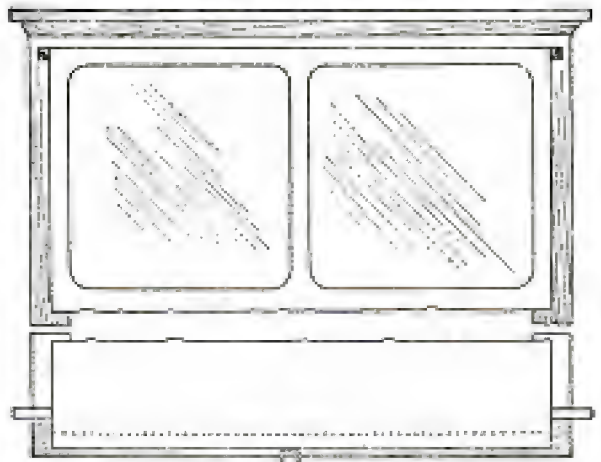
The Grinder will Easily Reduce Cabbage Heads to Bits Suitable for Sauerkraut

cylinder and turn the crank. Fine bits of cabbage, suitable for sauerkraut, will be the result. —Contributed by J. G. Allshouse, Avonmore, Pa.

Opening for Air at the Top of a Shade

Procure an extra long shade and cut two openings in the end to be used at the top. The openings may be cut square or ornamental as desired, leaving a strip at each side and one in the center. These strips are reinforced by gluing on some of the same material as the shade or pieces of tape.

A shade made in this manner per-

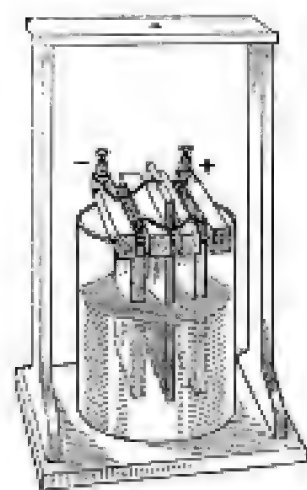


When the Shade is Pulled Down the Openings Coincide with the Opening over the Upper Sash

mits the air to enter the room unhindered when the top sash is lowered and at the same time obstructs the view of passers-by. —Contributed by Warren E. Crane, Cleveland, O.

A Homemade Wet Battery

Procure a large water bottle and have a glass cutter cut the top off so that the lower portion will form a jar



about $8\frac{1}{2}$ in. high. Next obtain two pieces of carbon, about 8 in. long, 4 in. wide and $\frac{1}{4}$ in. thick. Melt up some old scrap zinc and mold a piece having the same dimensions as the pieces of carbon. The mold for casting the zinc may be made by nail-

ing some $\frac{1}{4}$ -in. strips of wood on a piece of dry board, forming a shallow box, 4 in. wide and 8 in. long. Remove all the impurities from the surface of the zinc when it is melted, with a metal spoon or piece of tin. Before filling the mold with the metal, place a piece of No. 14 gauge bare copper wire through a small hole in one of the end pieces forming the mold, and allow it to project several inches inside, and make sure the mold is perfectly level. The zinc will run around the end of the wire, which is to afford a means of connecting the zinc plate to one of the binding posts forming the terminals of the cell.

Cut from some hard wood four pieces a little longer than the outside diameter of the glass jar, two of them $\frac{1}{2}$ by $\frac{1}{2}$ in., and two, $\frac{1}{2}$ by $\frac{3}{8}$ in. Drill a $\frac{1}{8}$ -in. hole in each end of all four pieces, the holes being perpendicular to the $\frac{1}{2}$ -in. dimension in each case, and about $\frac{3}{8}$ in. from the end. Boil all the pieces for several minutes in paraffin and stand them up on end to drain. Procure two $\frac{1}{8}$ -in. brass bolts, $3\frac{1}{2}$ in. long, which are to be used in clamping the elements of the cell together. The two smaller pieces of wood should be placed on each side of one end of the zinc, then the carbon

pieces and the larger pieces of wood outside the carbon pieces. The carbon plates should be connected together and then connected to a binding post which forms the positive terminal of the cell. If unable to obtain pieces of carbon of the required dimensions, a number of ordinary electric-light carbons may be used. Get about ten $\frac{1}{2}$ -in. carbons, without the copper coating, if possible; if not, file all the copper off. Cut these carbons off, forming 8-in. lengths. File the top ends of the carbons flat and so that they all become equal in thickness, and clamp them in place by means of the brass bolts. If rods are used, they should all be connected together by means of a piece of copper wire and then to a binding post.

The plates may now be hung in the jar, the wooden pieces resting on the top of the jar and acting as a support. The solution for this cell is made by dissolving $\frac{1}{2}$ lb. of potassium bichromate in $\frac{1}{2}$ gal. of water, and then adding very slowly $\frac{1}{2}$ lb. of strong sulphuric acid. More or less solution may be made by using the proper proportion of each ingredient.

This cell will have a voltage of two volts, a rather low internal resistance, and will be capable of delivering a large current. If it should begin to show signs of exhaustion, a little more acid may be added.

A chemical action goes on in this cell regardless of whether it supplies current to an external circuit or not, and for this reason the elements should be removed from the solution and hung directly over the jar when the cell is not in use. A simple device for this purpose may be constructed as shown. A cord may be passed through the opening in the crossbar at the top and its lower end attached to the elements. When the elements are drawn out of the solution, the upper end of the cord may be fastened in some manner. This frame can, of course, be made longer, so it will accommodate a number of cells.

Hulling Walnuts

When gathering my winter supply of walnuts, I found that they could not be hulled readily by hand. Not knowing of any machine designed for the purpose, I tried running them through a corn sheller and found it to do the work nicely. The sheller not only hulled them, but separated the nuts from the hulls, the nuts being carried out through the cob opening and the hulls dropping through the grain spout.—Contributed by Irl R. Hicks, Hallsville, Mo.

How to Make a Small Vise Screw

Procure an ordinary lag screw, as shown in Fig. 1, cut off the pointed end and file the threads into the shape



A Vise Screw Formed of an Ordinary Lag Screw, the Threads being Made Square and a Handle Attached

shown in Fig. 2. A hole is drilled through the head and a handle put in, as shown in Fig. 3. This makes a good substitute screw when the original screw for a small vise is broken.—Contributed by James M. Kane, Doylestown, Pa.

A Medicine-Spoon Holder

When a dropper is not at hand it is difficult to drop medicine in a spoon while holding it, and the shape of the spoon will not permit its being set down. A shoe horn used as shown in



A Shoe Horn Is the Right Shape to Hold the Spoon Right Side Up and Level

the sketch will hold the spoon right side up and in a position to hold the liquid.—Contributed by Maurice Baudier, New Orleans, La.

Knife Holder on a Frying Pan

Instead of laying a knife on the stove or carrying it to a table or elsewhere while frying anything in a pan,



The Shape of the Clip and Manner of Attaching It to a Frying Pan

make a clip to fit the edge of the pan for holding the knife when it is not in use. The clip is easily made of brass wire and when attached to a frying pan it will save many steps.—Contributed by John C. Harlacker, Jr., Cumberland, B. C.

A Broom for Sweeping Out Corners in Steps

Sweeping the corners of steps is one of the greatest difficulties of the housewife, or others who have a number of stairs to sweep. I have made this task easy in a very simple manner. I secured a used broom, the longer and newer the better, and cut the straws off diagonally across the sweeping edge. The pointed part will easily clean out the corners in steps or in a room.—Contributed by W. A. Stamaman, Berlin, Ontario.

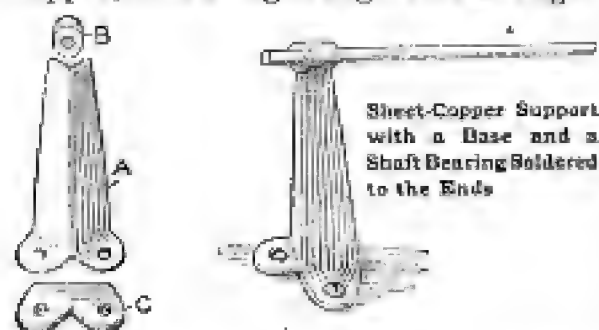


Removing a Cork from a Bottle

A cork that has been pushed into a bottle accidentally or otherwise can be easily removed in the following manner: Tie several knots in one end of a string to form a large cluster and drop it into the bottle, holding on to the other end of the string. Turn the bottle over so that the cork will fall to the opening in the neck, then pull on the string. The cluster formed by the knots at the end of the string will easily draw out the cork.—Contributed by Frank Hart, Chicago, Ill.

Bearings for Model Work

For experimental work I use hangers or bearings made of sheet brass or copper, bent at right angles for strength

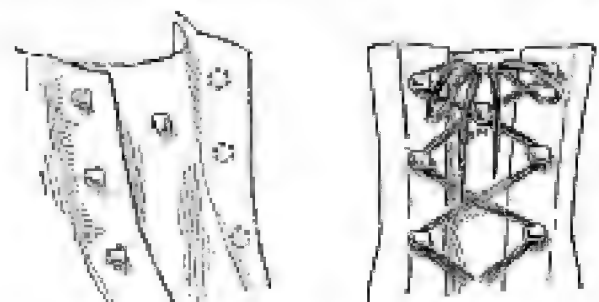


and capped with a box. The main part of the bearing A is shaped as shown, and the box B consists of a small piece cut from a brass rod and drilled for the size of the shaft. The box is soldered to the top end of A and the base C to the bottom end. When a large metal base is used for a certain model, the part A is attached directly to that base and the part C need not be used.

The bearings can be made in different heights, each of which will demand a corresponding size and thickness of the parts. Sheet brass or copper, $\frac{1}{8}$ in. thick, is about right for a bearing 3 in. high.—Contributed by W. E. Day, Pittsfield, Mass.

Holding the Tongue of a Shoe in Place

The tongue in a shoe will often slip down or over to one side or the other and expose the hose. To overcome



The Hook on the Tongue of the Shoe and Manner of Lacing to Hold the Tongue

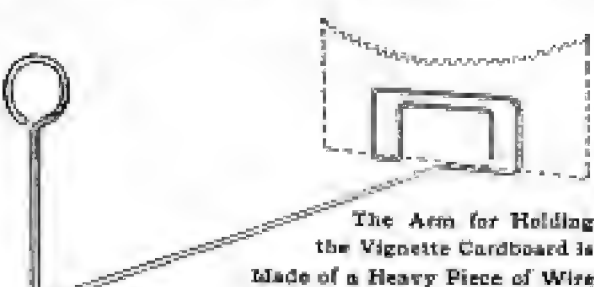
this and have the tongue fit snugly in the right place, fasten a common lace clasp or hook near the top of the

tongue, as shown in the illustration, so that in lacing the shoe the laces are passed under the hook to hold the tongue in place.

A Photo Vignetter

Procure a piece of heavy wire, one that is fairly stiff, says Camera Craft, and a pair of pliers and bend the wire with the pliers as shown in the illustration. After the loop is made to fit around the lens barrel the wire is bent at right angles at a point 6 in. below the circle. At a distance of 8 in. on the extending part of the wire it is bent as shown to form a clip for holding a sheet of cardboard.

The cardboard should be about 7 in. wide and of dark color, with one edge cut semicircular and notched. The



size of the wire and the other measurements will depend upon the size and focal length of the lens. If a heavy vignetting card is required, it may be necessary to make the portion that encircles the lens double in length, bending it back upon itself to secure a firmer hold. This is a cheap and efficient vignetter that anyone can make in a few moments of spare time.

Pocket for the Inside of a Book Cover

Students or anyone wishing to retain notes on a subject will find it quite handy to have a large envelope pasted in the back of each textbook. Instead of having notes all through the book, they can be arranged in order and slipped into the envelope. If the book is accidentally dropped, the notes will not be lost.—Contributed by Harold Mynning, Chicago, Ill.

How to Make an Electric Furnace

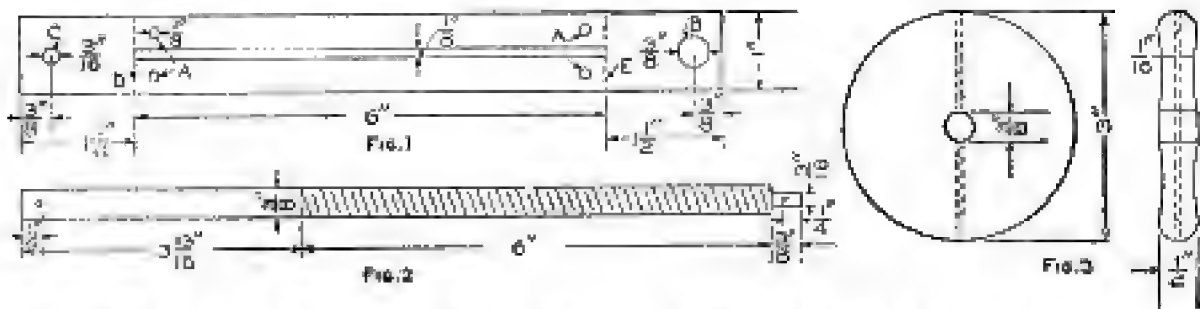
A small electric furnace that will be very serviceable in a laboratory may be made as follows:

First procure a small clay flowerpot, about 4 in. in diameter at the bottom, and also a small clay crucible, about 2 in. in diameter at the bottom and at least 1 in. less in height than the flowerpot, and having as nearly as possible the same slope to its sides as the pot. Now obtain a small quantity of asbestos compound and pack it around the small crucible inside the flowerpot. Make sure the crucible is in the exact center of the flowerpot and that their tops are even with each other. Assuming that ordinary electric-light carbons are to be used, which are about $\frac{1}{2}$ in. in diameter, drill two $\frac{5}{8}$ -in. holes, exactly opposite each other, through the walls of the flowerpot and asbestos compound so that they enter the crucible about $\frac{3}{4}$ in. above its bottom on the inside. A suitable lid for the furnace may be made from $\frac{1}{4}$ -in. sheet asbestos and should be large enough to cover the top of the flowerpot.

The feeds and supports for the carbon electrodes are constructed as follows: Procure two pieces of $\frac{1}{8}$ -in. brass, 1 in. wide and 9 in. long. Cut a $\frac{1}{8}$ -in. groove lengthwise in the center of these pieces to within $1\frac{1}{2}$ in. of each end, as shown in Fig. 1. Drill four $\frac{1}{8}$ -in. holes, AA, in each piece, a $\frac{3}{8}$ -in. hole, B, in one end and a $\frac{7}{8}$ -in.

two $\frac{3}{8}$ -in. rods, $10\frac{3}{8}$ in. long. Turn one end of each down to a $\frac{1}{8}$ -in. diameter for a distance of $\frac{3}{8}$ in. From that point thread the same end of the rods for a distance of 6 in. Drill a $\frac{1}{8}$ -in. hole in each end of the rods a little less than $\frac{1}{4}$ in. from the ends. The dimensions of the rods are given in Fig. 2. Two small rubber or wooden handles, similar to the one shown in Fig. 3, should now be made and fastened to the large ends of the rods by means of $\frac{1}{8}$ -in. steel pins. Obtain two pieces of brass of approximately the following dimensions: 1 in. by 1 in. by 3 in. Drill four holes in each of these pieces as shown in Fig. 4. The hole H should be just large enough to allow the carbon to enter, or about $\frac{1}{2}$ in. in diameter. The hole G should be tapped to take a $\frac{1}{4}$ -in. machine screw, the hole F should be threaded so that the threaded rods will enter, and a small binding post should be mounted on a lug fastened in the hole J. Cut away one end of this piece as shown in Fig. 4 until it is a little less than $\frac{1}{8}$ in. in thickness, or so it will enter the grooves cut in the brass strips.

The parts of the furnace are now ready to assemble, which may be done as follows: Procure a piece of well seasoned board, hard wood if possible, about 1 in. thick, 8 in. wide and perhaps 20 in. long. Cover one side of this board and the edges with some $\frac{1}{8}$ -in. sheet asbestos. Now place the



Details of the Base, Rod and Handle for Each Carbon Feed, Which is Attached to the Large Base on One Side of the Furnace

flowerpot in the exact center and then mount the grooved brass strips one on either side of it with the longest dimension parallel to the longest dimen-

sion of the flowerpot. Now place the

sion of the board and the inside end about 1 in. from the side of the pot. The end with the $\frac{1}{8}$ -in. holes should be next to the pot. Assemble the parts of the carbon feeds and then cut out some circular disks of asbestos to place under the flowerpot so as to raise it to such a position that the holes in its sides will be on a line with the carbon rods. Three long screws should now be placed in the board, forming the base, in such a position as to hold the flowerpot always in place. This completes the furnace proper, which is shown in Fig. 5. The furnace can now be put



Fig. 4

into operation provided there is a suitable current rheostat to connect in series with the carbon arc to prevent an excessive current being taken from the line. If such a rheostat is not available, a serviceable one may be made as follows:

Obtain two pieces of $\frac{1}{16}$ -in. sheet iron, 6 by 6 in., that are to form the end plates. Cut off the corners of one piece so as to form an octagon and drill a number of $\frac{1}{8}$ -in. and $\frac{1}{4}$ -in. holes in it, as shown in Fig. 6. Bend the corners of the other piece down along the dotted lines marked L, Fig. 7, and then make a second bend in each corner along the dotted lines K, so that the outermost portion of the corner is parallel to the main portion of the piece. Drill a number of $\frac{1}{8}$ -in. holes in this piece as indicated. A 3-in. opening should be cut in the center of this piece to

give access to the interior of the completed rheostat. Now obtain eight $\frac{3}{8}$ -in. iron rods, 10 in. long. Drill and tap each end of these rods to accommodate a $\frac{1}{8}$ -in. machine screw. Wrap several layers of thin sheet asbestos around each rod and tie it in place with some thread. These rods should now be fastened between the end plates by means of a number of iron machine screws. Mount four back-connected binding posts on the plate shown in Fig. 6, making sure they are insulated from the plate by means of suitable bushings and washers.

Procure a small quantity of No. 14 gauge iron wire. Fasten one end of the wire under the head of the screw holding one of the binding posts in place and then wind it around the rods

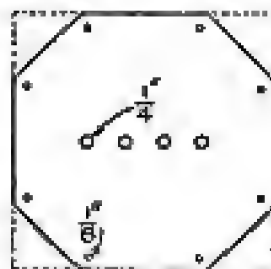


Fig. 6

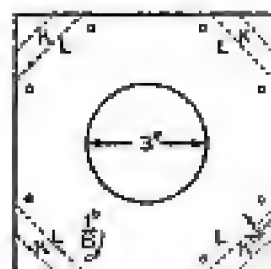


Fig. 7

Detail of the Upper and Lower End Plates That are Used in Making a Rheostat

about 20 times, making the distance between the turns equal to the diameter of the wire. After winding on the 20 turns, attach a short piece of wire to the main wire and fasten the free end of the short piece to one of the other binding posts. Wind on 20 more turns, and make another connection to the third binding post, then complete the

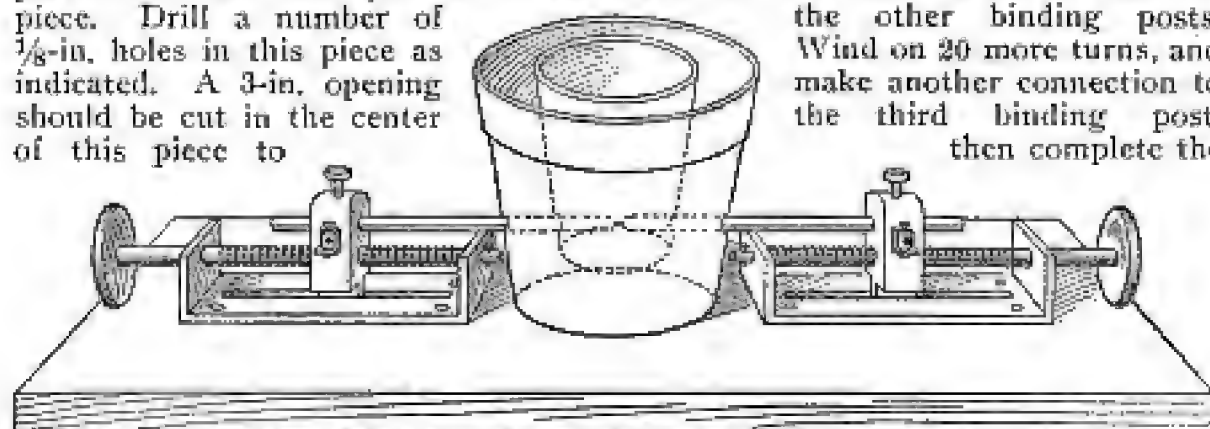


Fig. 5

The Furnace Consists of a Flowerpot in Which a Crucible is Set, and on Either Side the Carbon Holders are Fastened to the Base

winding and attach the end to the remaining binding post. Different amounts of this resistance can now be connected in series with the arc by changing the connections from one binding post to another. The rheostat

may be located on a bracket fastened to the wall, but care must be taken not to place it in such a position that it will come into contact with inflammable material. As an extra precaution, the circuit should be properly fused.

Cleaning Brass Articles

Embossed or undercut brass work may be easily cleaned by boiling the pieces in a strong solution of caustic soda or lye, and then immersing them in a mixture of hydrochloric acid, 6 parts; water, 2 parts, and nitric acid, 1 part, until they become covered with a dark deposit. Take them from the solution and remove the black substance with a fine scratch brush. After cleaned in this manner, rinse in hot water and dry in hot sawdust.

A fine orange-yellow tinge may be given to the brass by substituting an equivalent weight of powdered alum for the nitric acid in the solution.—Contributed by Mrs. Richard F. Pohle, E. Lynn, Mass.

A Whetting Block

A handy tool gauge for sharpening the various tools about the household is made of a block of wood with the sides of one end cut sloping in different degrees so that each will serve to secure the proper slant of the cutting edge on a certain tool.

The block of wood with the corners cut is shown in Fig. 1, and the man-



FIG. 1



FIG. 2

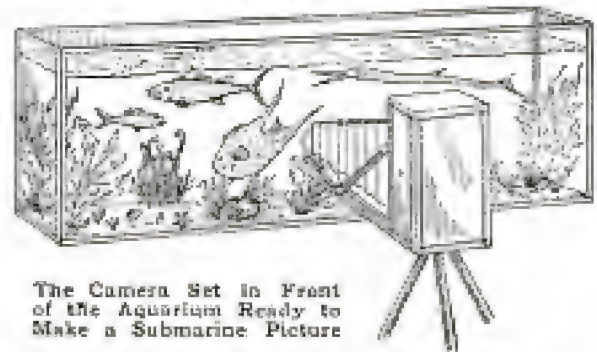
The Sloping Edges on the Block of Wood and the Manner of Whetting a Chisel

ner of whetting a chisel is shown in Fig. 2.—Contributed by Will Parker, Wibaux, Mont.

CA cardboard cut the same size as a page and fastened with paper clips in the center of a magazine will prevent the pages from folding over when the magazine is placed in a bookcase.

Submarine Photographs

A photographer at a seashore resort, wishing to increase his sales of souvenir postal cards, rigged up a device for



The Camera Set in Front of the Aquarium Ready to Make a Submarine Picture

producing negatives to make "submarine" pictures. The device consisted of an aquarium, about 40 in. long, 18 in. high and 6 in. wide. The aquarium was designed to stand on edge or the narrow way, and was equipped with rocks, living sea moss, kelp, and some fish, and the bottom was covered with sand and shells.

A canvas was hung back of the aquarium and the camera set in front at such a distance as to make a negative of only the water and the prepared sea bottom. Very fine views that will give the appearance of being made at the bottom of the sea can be produced.

Mending Paper-Pulp Utensils

Pails, washtubs, and other receptacles made of paper pulp, when cut and worn, may be easily mended with adhesive tape. After this is applied to the place to be mended, give the mended part a coating of paint, and when the paint has dried, the surface is given another coat to match the color of the article mended. Leaks may be entirely stopped in this way at a very reasonable cost.—Contributed by Katharine D. Morse, Syracuse, N. Y.

Ruling Blank Books

A special ruling for a blank book can be drawn by using a thin piece of sheet metal or cardboard, cut as shown

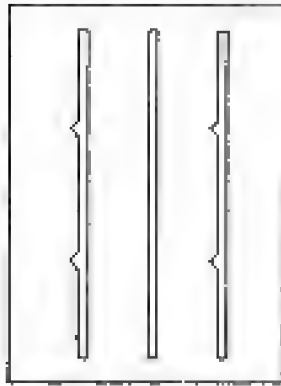


FIG. 1

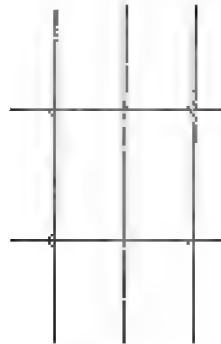


FIG. 2

A Template Having Slots Cut for Drawing Special Vertical and Horizontal Lines on Pages

in Fig. 1, for a template. The pencil is drawn along one edge of the cut-out so that it will make lines as shown in Fig. 2.

If horizontal lines are required, cut notches on the edge for the location of each line as shown. When the vertical lines are drawn, these notches will mark the places for the horizontal lines.

How to Demagnetize a Watch

Quite often the attendants or a visitor to an electric-light plant discovers after a few days that his watch is losing a half hour or more a day by having become magnetized by the dynamos. In stations where the old types of machines are still in use there is a great deal more danger from what is called "stray" magnetic fields than in those where modern machines are installed.

The jeweler demagnetizes a watch in the following way: He has a piece of soft iron with an opening cut in its center of such shape and size as to receive the watch, and with a fine wire wound about it. After the watch has been placed in position, an alternating current, that is, one whose direction is changing at regular intervals, is sent through the winding, and thus a magnetic field is produced that also

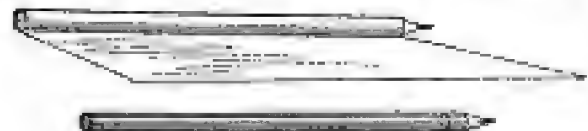
changes in direction as the current reverses. The current is gradually reduced in value and the magnetism originally possessed by the watch is removed. When an alternating current is not available, a direct current may be used, its direction being rapidly reversed by what is known as a "polarity changer."

Anyone can demagnetize his own watch, however, with very little trouble and no expense by a much simpler method. Procure a piece of heavy linen thread about 3 ft. long, attach one end of it to the ring of the watch, hold the other end and turn the watch around until the thread is twisted at least one hundred times. Now allow the thread to unwind, and as the watch revolves, pass it back and forth near a powerful electromagnet. The field magnet of a good-sized generator or motor will answer. The machine should be in operation, or at least there should be a current in the windings about the fields, when you attempt to demagnetize the watch. While the thread is unwinding, and the watch moved in the magnetic field, gradually withdraw from the magnet so that when the clock ceases to revolve, it is just outside of the field.

Always be sure to keep the watch revolving while it is in the magnetic field, otherwise the results will be very unsatisfactory, and more harm than good may result.

A Pencil Holder

Procure a piece of paper, 7 in. long and 4 in. wide, and roll it one time around a lead pencil, then coat the remaining surface of the paper with glue. Roll this around the pencil and a tube is formed, which will hold a



A Stub of a Pencil can be Easily Held in the Tube for Writing

pencil or even pieces of pencil down to $\frac{1}{4}$ in. in length.—Contributed by W. D. Brooks, Paterson, N. J.

A Poultry-Food Chopper

The illustration shows a handy device for cutting roots for food, and for chopping and mixing stale bread, potatoes, peelings, refuse fruit, etc., for poultry. Any blacksmith can make the chopper at little cost. For the cutting blades use two pieces of steel a little heavier than oil-barrel hoops, each $1\frac{1}{2}$ in. wide and 8 in. long. Procure a $\frac{1}{2}$ -in. iron rod, about 3 ft. long, bend one end in the shape of a spade



The Chopper Consists of a Rod Handle to Which Blades are Attached by Riveting or Welding

handle and split the other end for a distance of about $2\frac{1}{2}$ in.

Sharpen one edge of each blade and curve the metal slightly. Lay the two blades together with the convex sides touching in the center and insert them in the slit in the handle end. They are riveted or welded in place. Heat and bend the blades at right angles.

Many of the materials mentioned for poultry foods may be chopped in an ordinary pail having a strong bottom, but it is best to make a box, about $1\frac{1}{2}$ ft. square and with a plank bottom, for use with the chopper.

A Small Spring Hinge

Box covers or small doors that are seldom used can be supplied with a small spring hinge as shown in the illustration. The hinge is made of a piece of spring wire which is formed similar to a staple with a coil or complete turn given to the wire in the



The Shape of the Hinge, and the Manner of Attaching It to a Cover or Door

center. It is attached by driving the points, one into the door and the other into the casing.

Shoestring End

When the tips slip from shoelaces, new ones may be readily made of fine wire. The wire is run through the end of the lace, Fig. 1, and the two ends

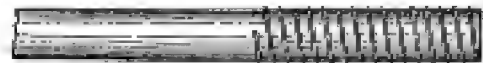


The Wire Prevents the Lace from Ravelling and Makes a Tip for Easily Entering the Eyelets

are twisted tightly together as shown in Fig. 2. This covers the end of the lace and makes a tip that is easily passed through the eyelets.

Threads on Wood Shafts

In model making it is quite necessary at times to have threads on a wood shaft. These can be made quite



The Wire Forms a Thread That in Many Instances is Quite Serviceable for Model Making

satisfactorily by coiling a wire around the shaft where the threads are wanted, and driving the ends into the wood.

A Glass Breaker

After cutting glass, and especially where a small strip is to be removed, the part must be broken away in small



The Nut is Set to the Thickness of the Glass and Used to Break Pieces Away

pieces. The accompanying sketch shows a very useful tool for this purpose. The tool is made of a piece of metal having a bolt fastened to it at one end whose nut can be adjusted to the thickness of the glass.

Old discarded blueprints can be made white and used for sketching by dipping them in a solution of soda and water, in the proportions of 4 oz. of soda to each gallon of water.

Wood Postal Cards

The card consists of three pieces, or three-ply, veneer. The grain of the outside veneer runs lengthwise, while that of the inside piece runs crosswise. This makes the card straight and keeps it from breaking. For the inner section, walnut, which may be had as thin as $1/64$ in., or any thin straight-grained veneer may be used. Two pieces of veneer, about $3\frac{3}{4}$ in. wide and 6 in. long; one piece, 6 in. wide and $3\frac{3}{4}$ in. long,—the length being with the grain of the wood—and two blocks of wood, known as cauls, of the same size or a little larger, and about $\frac{3}{8}$ in. thick, are required.

The veneer is laid flat on a board and cut with a sharp knife or fine saw along the edge of a ruler. The three pieces are glued together in the following manner. Use ordinary hot glue, not too thin, but thin enough to run freely from the brush. The glue is applied evenly on both sides of the inner piece only, and this is then stood on edge until the glue chills. Then the cauls are heated. This is best done on a stove, or on stove lids over a gas fire. While the blocks are being heated, put one veneer on either side of the middle piece, and a piece of thin paper on each side to keep the glue from the cauls. A hand screw or vise should be opened to almost the distance required. One of the cauls is now laid flat, the veneers upon it and the other caul on top. This should be done quickly. Then clamp the whole firmly together. While the full pressure is only needed for about two hours, the pieces should be allowed to dry between the cauls for, say, a day or two, so that they will keep straight. The size of the finished card is $3\frac{3}{8}$ in. by $5\frac{1}{2}$ in. It is cut and planed to size while lying flat on a board, the plane being pushed along on its side on the bench top. To dress or clean, clamp one side to the bench. While a scraper blade may be used to advantage, it is not essential, as a block of wood and sandpaper will do. The thinner it is dressed the better. The sharp edges

should be removed with sandpaper. The writing on a wood card is not done in the ordinary manner, as the ink would run. The surface must be prepared, which also gives a finish to the wood. Melt some wax or paraffin in a suitable vessel and cover the surface of the wood, using a brush or rag. The lines for the address on one side are then drawn, and the writing is done with a hard lead pencil. When through writing on one side, cover it with some strong aniline stain. (Aniline, dissolved in hot water, commonly known as water stain and used especially to stain mahogany, is the right kind.) Do not remove the wax that was raised by the pencil point. Brush the stain over until the whole side is covered. When dry, repeat on the other side. In about an hour the wax may be scraped off with a dull scraper or some other dull instrument. After every particle of wax has been removed, the card is given a good rubbing with a clean, soft rag. It is well to protect the hands as well as the table during the process.—Contributed by Chas. Schapmeier, Baltimore, Md.

Fastening Screws in Tile and Brick Walls

A simple way to fasten screws in tile or brick walls is to drill holes, not too large, for the screws, then tear up some paper, wet it and make a pulp. Pack this pulp tightly in the hole and turn in the screws. The screws will stand a great deal of strain.—Contributed by John Thomas, Brantford, Ont.

Shoe Pull Made of an Eyelet

The pulling-on strap at the back of a shoe often comes loose, or pulls out, and even if it does not, the trousers will sometimes catch on it if the strap is not tucked inside of the shoe. A very simple way to overcome these troubles is to remove the straps and substitute eyelets. A buttonhook will then serve admirably in pulling the shoe onto the foot.

PATENTS, PRACTICAL
OR UNIQUE

Fig. 1



Fig. 2



Fig. 3



Fig. 4



Fig. 5

BOTTLE OPENER—A simple and handy device for removing bottle caps is shown in Fig. 1. Attached by screws to the side of a table or cabinet, or to the woodwork of a kitchen or pantry, all that is necessary is to insert the head of the bottle under it and pull the bottle outward. This action lifts the cap off in the same manner as the ordinary hand cap remover, but as neither hand has to be placed near the head of the bottle there is no danger of injury through a slip of the opener or the breaking of glass.

LIQUID-SPRAYING COMB—Figure 2 shows a hair comb invented by a German and recently patented in Germany and England. It is a hollow comb adapted to spray liquid through the teeth while the comb is being drawn over the scalp. It may be combined either with a bulb and bellows, or with a siphon, as the means for providing the necessary pressure.

COMBINED CIGAR CASE AND CIGAR CUTTER—In Fig. 3 a cigar cutter is adapted as a fastener for a cigar case. It may be used in the same way in connection with a match box. In the cigar-case combination, the cutter is mounted on a support on the case, which support may also have hinged to it an ash tray.

COMBINATION ERASER AND PEN EXTRACTOR—The combination eraser and pen extractor shown in Fig. 4 comprises an elastic erasing body having sockets into which are inserted the corrugated tines of a pen extractor, formed with two spring jaws soldered together and provided with intumed ends for gripping the pen.

COMBINED OPERA GLASSES AND SOUND INTENSIFIER (British patent)—An ingenious combination is shown in Fig. 5, consisting of a sound-intensifying appliance attached to a pair of opera glasses. The ends of the objective tubes of the opera glasses are provided with apertures for receiving sound waves. Ear tubes are connected to the ocular tubes of the glasses by nipples, the central bridge of the glasses being provided with recesses to receive the nipples when the glasses are compressed.

COMBINED SHIRT AND PANTALOONS (British patent)—A shirt combined with pantaloons is shown in Fig. 6. The arrangement is novel, and one that may be found practical for dress shirts. It would, at least, prevent the stiffly starched front of such shirts from climbing out above the low-cut opening of the waistcoat.

GRASS CLIPPER—Figure 7 illustrates an ingenious device for the trimming of lawn borders. It comprises a cutter bar the operation of which is similar to that of a regular grain or hay-harvesting machine. The cutter bar is operated from the handle by opening and closing first one hand and then the other over the handle and the little lever extending out from each side under the handle, so as to give the cam a reciprocating angular motion which is transmitted in the ordinary way to the sliding cutter.

ILLUMINATED BUTTONS—Figure 8 illustrates a set of illuminated buttons, consisting of three miniature electric-light bulbs attached to a flexible wire connecting with a breast-pocket battery. The pressing of the switch button, attached to a second flexible-wire connection and adapted to be carried in another pocket, causes the buttons to light or go out.

NURSING-BOTTLE HOLDER FOR BABY CARRIAGES—An adjustable holder for the baby's milk bottle, particularly designed for perambulators, is shown in Fig. 9.

POTATO PLANTER (British patent) — A potato-planting apparatus adapted to be detachably connected to a plow is illustrated by Fig. 10. The endless chain running around the V-shaped frame, picks up the potatoes from the carrying receptacle, carries them over the frame and down in front of the plow share where they are discharged one by one. In a modification of this machine, the potatoes are delivered behind the plow share.



Fig. 6

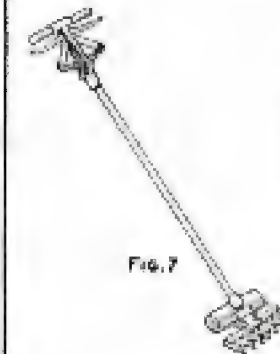


Fig. 7

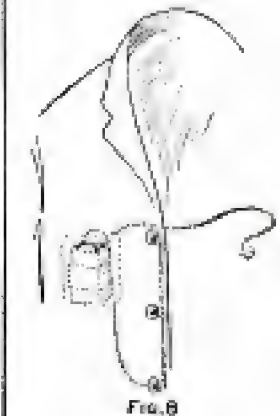


Fig. 8

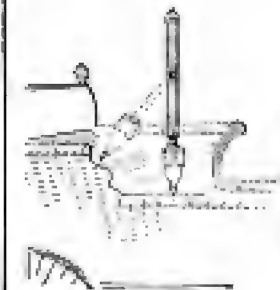


Fig. 9



Fig. 10

THE man in the upper berth leaned over its edge, and, jamming his frown firmly down on his brow, cried in a harsh, coarse voice that was audible above the rattle and rumble of the engine:

"Hi, you, down there. Are you rich?"
 "Hey!" ejaculated the man in the lower berth, almost swallowing his Adam's apple. "Whizzer nasser?"

"I say, are you rich?"
 "What's that, sir! Rich? What do you mean by waking me up in the middle of the night to ask me such a question as that?"

"I want to know—that's why."
 "Well, then, confound you, I am rich. Now I hope your curiosity is satisfied and you will let me go to sleep."

"Very rich?"
 "Millionaire, confound you. Now shut up, and—"

"Well, then, why in torment don't you charter a whole train to do your snoring in?"—Searchlight.

There was a young fellow named Fred,
 In an aeroplane flew overhead;
 His barograph showed
 He had been where it snowed,
 But his epitaph shows that he's dead.
 —Detroit Free Press.

Jones had just run over to see if Mr. and Mrs. Blank would go to the theater with them. Mrs. Blank was sorry, but, unfortunately, Blank was out. Probably he was at the club. She would telephone. The following conversation ensued: "Hallo! Is this the _____ Club? Is my husband there? Hallo! Not there? Sure? Well, all right, then; but hold on. How do you know? I haven't even told my name." "There ain't nobody's husband here—never," was the wise attendant's reply.—Telephony.

First Autoist—I feel that I have lived in vain.
 Second Autoist—How so?
 First Autoist—I have never gratified the ambition of my life—to run over a traffic policeman.—Satire.

"So you want a position in my firm?" said the merchant to the applicant. "Well, what were you in your last job?"

"A door, sir," answered the sad-eyed applicant.

"What's that?" asked the employer.
 "Well, sir," said the sad-eyed one, "I was the door, and the rest were the tellers. When my governor wanted a thing done he would tell the cashier, the cashier would tell it to the bookkeeper, and the bookkeeper would tell it to his assistant, his assistant would tell it to the chief clerk, and the chief clerk would tell it to me."

"And what would happen then?"
 "Well, sir," replied the sad-eyed applicant, "as I hadn't got any one to mention it to, I'd go and do it."—The New York Sun.

"This medicine isn't having much effect, Doc."
 "I saw the druggist about the prescription."
 "Ah, he is doubtless to blame!"
 "No, he isn't altogether to blame. It seems you handed him a laundry check."—Kansas City Journal.

The station master on the Eastern Indian Railway had been given strict orders not to do anything out of the ordinary without authority from the superintendent. This accounts for his sending the following telegram:

"Superintendent's Office, Calcutta.
 Tiger on platform eating conductor. Please wire instructions."—London Daily Mail.

There was a delay at a moving picture show in Platteville. The people present grew restless. It was up to the manager to explain.
 He came out and said: "Ladies and Gents: The darned machine's busted again! I thank you."—Philadelphia Saturday Evening Post.

Greene '16—"Why do you study Latin when it's a dead language?"

Beane '18—"Why do you study English when it's been murdered so often?"—The Dartmouth Jack-o-Lantern.

Two girls on the Cicero field wanted some ice cream. Now, there was no ice cream on the field at the time. However—

"Ice cream, Mademoiselles?" quoth Aviator Max Lillie, "it already is done. Be not downcast. Ho! varlet, turn 'er around." "Er," was his biplane.

With Drew in the seat they set sail into the east. They came down in the open space in front of St. Anthony de Padua hospital in Garfield park, where there was a refectory. Also ice cream.

Later Drew held carefully strange packages in his hands, a red cherry on top of each. Motors buzzed. Propellers whirled. The machine arose, then settled at the feet of the damsels in distress.

"Your ice cream, Mademoiselles," announced Cavalier Lillie, with deep bow, taking the succulent dainties from the faithful Drew.

"My bird of the air is to serve, and whom, if not the fair? There could have been brought a freerful, but it was not deemed necessary."

The blushing maids ate in contentment.
 Then Drew told of it.—Aero and Hydro.

"On the one hand," said the teacher, pointing a long finger to the map on the classroom wall, "we have the far-stretching country of Russia. On the other hand—what do we see on the other hand—Tommy?"

"Warts!" hazarded Tommy, hopeless with fright.
 —Tit-Bits.

Two men were hotly discussing the merits of a book. Finally one of them, himself an author, said to the other:

"No, John, you can't appreciate it. You never wrote a book yourself." "No," retorted John, "and I never laid an egg, but I'm a better judge of an omelet than any hen in the state."—Publisher and Retailer.

Husband—My wife explored my pockets last night.
 Friend—What did she get?
 Husband—Oh, what an explorer usually gets—enough material for a lecture.—Chicago Day Book.

"I breathe my vows from a surcharged heart," murmured the young man.

"Nonsense, Henry," said the college damsel. "You don't breathe from your heart; you breathe from your diaphragm."—Washington Herald.

A precocious child who had been attending one of the public kindergartens fell from a ladder. Her mother caught her up from the ground in terror, exclaiming:

"Oh, darling! How did you fall?"
 "Vertically," replied the child without a second's hesitation.—Satire.

"With all your wealth are you not afraid of the proletariat?" asked the deliver in sociological problems.

"No, I ain't," snapped Mrs. Newrich. "We boil all our drinkin' water."—Railroad Men.

"I saw Pibble standing on a corner yesterday winding up his estate."

"His estate?"
 "Yes, a dollar watch."—The Harvester World.

Baker—I was out in Blakesley's motor last week. He has everything in it, even a pedometer.

Barker—You mean a speedometer, old man. A pedometer is an instrument for measuring how far you walk.

Baker—All right, I'll stick to pedometer.—Harper's Bazaar.

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Your Telephone Horizon

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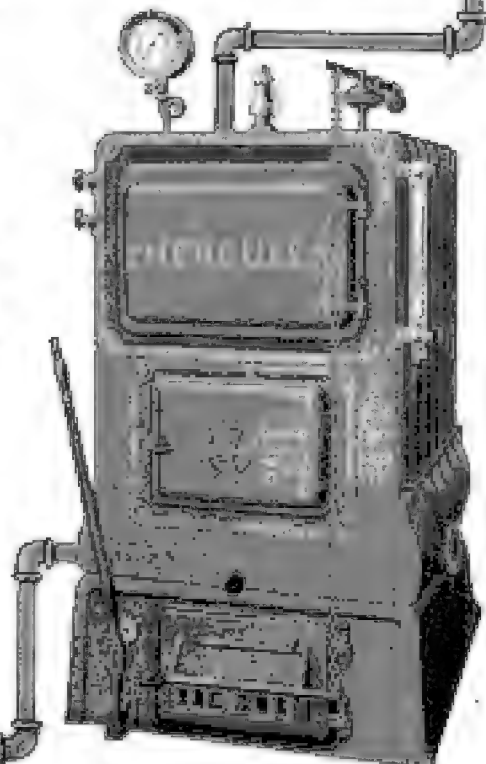
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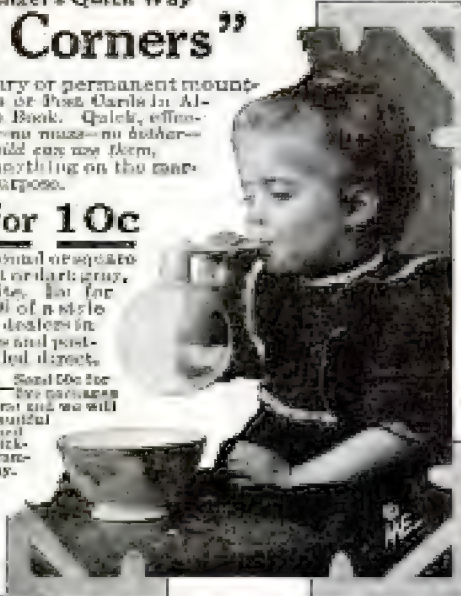
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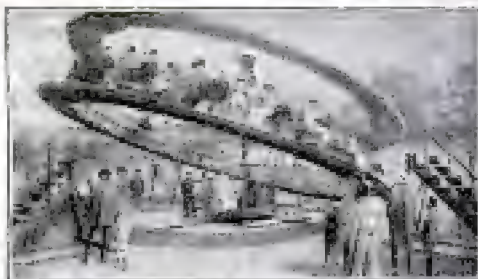
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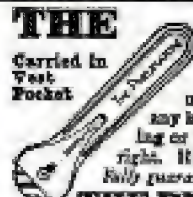
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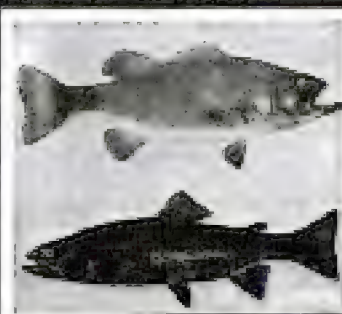
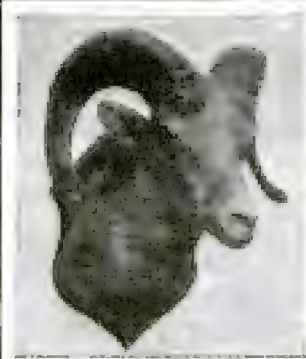
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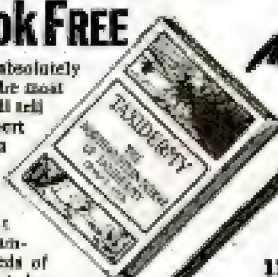
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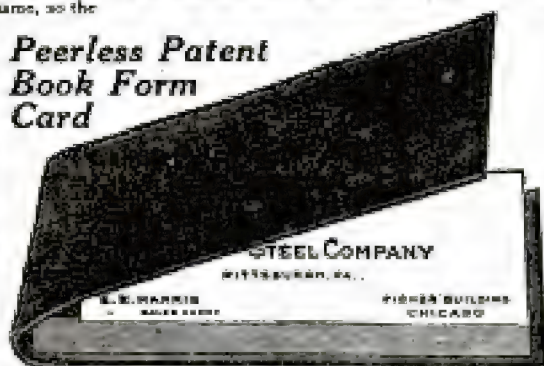
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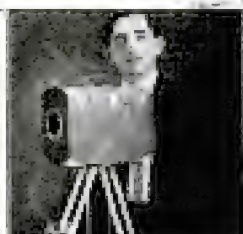
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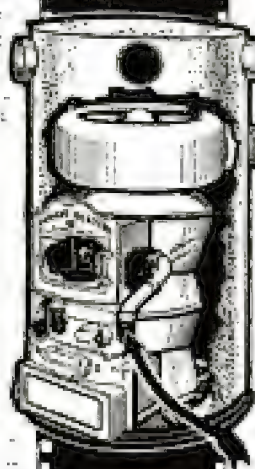
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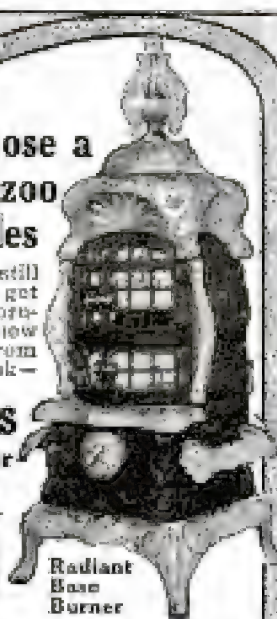
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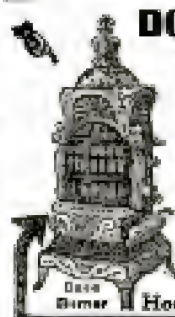


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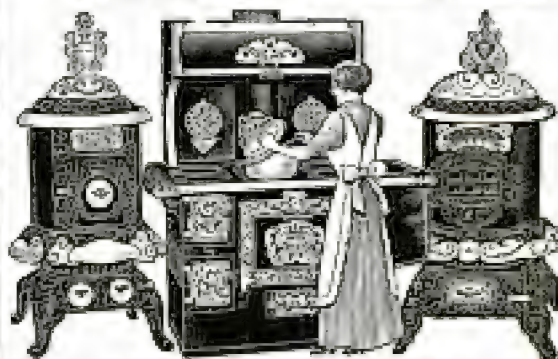
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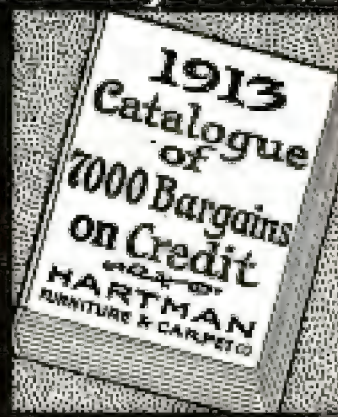
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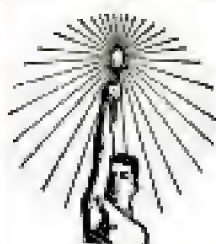
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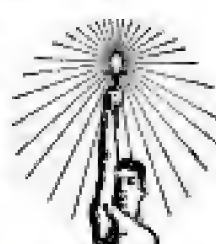
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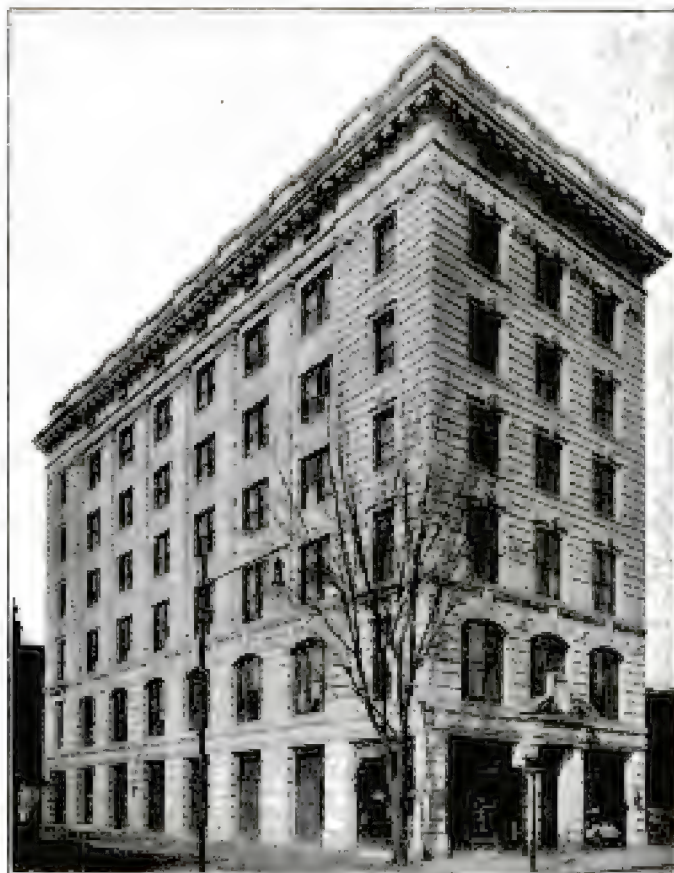
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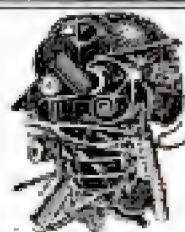
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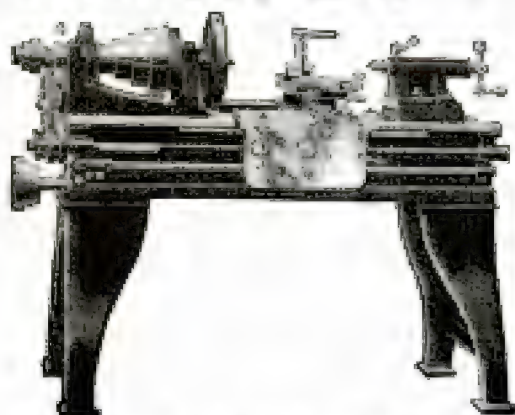
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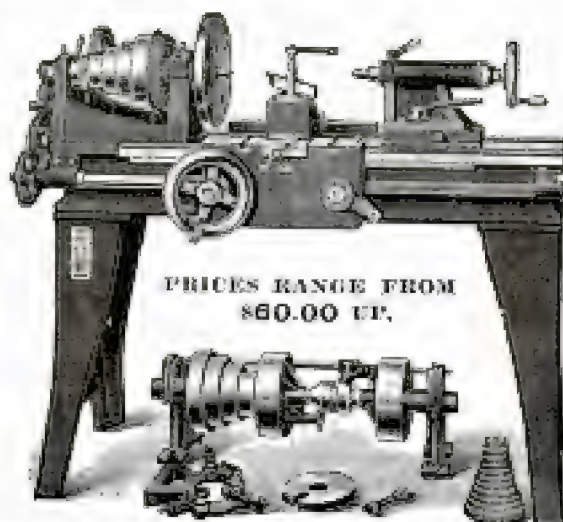
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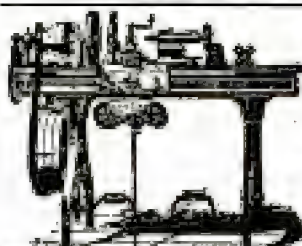
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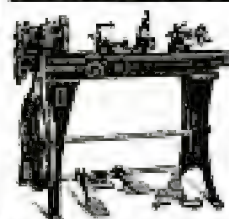


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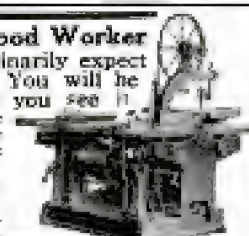
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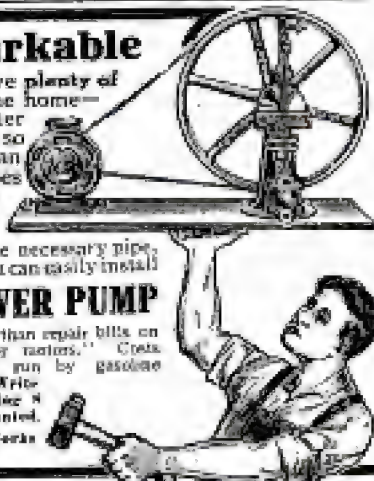
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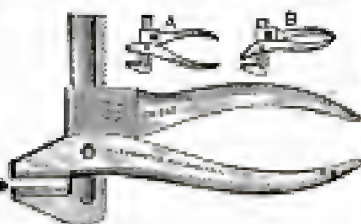
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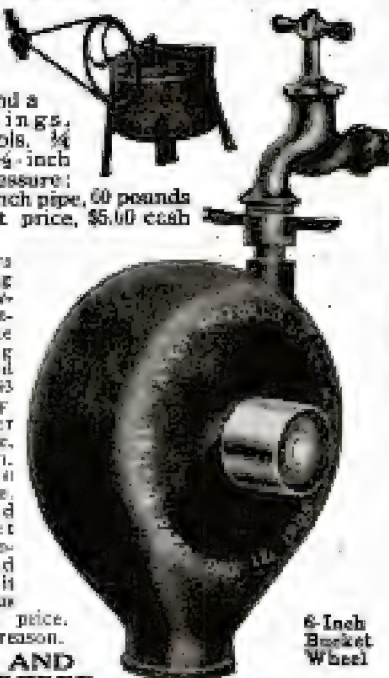
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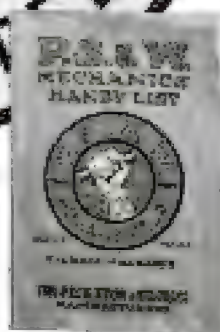
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sample." Low price, big profit, great value, quick sales. Drop
everything; write for sample and instructions.

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Measuring Tapes



Standards of efficiency for the
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An actual photograph of **WILLIAMS' WRENCHES** taken from the 57th story height of the new "record" Woolworth Building, in the centre of construction, 750 ft. above City Hall Park, New York City. ★ Singer Building, 41 stories in height,

A big business like a big building demands a solid foundation. The structural worker's knowledge of

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QUALITY eliminates **his** fear! Careful inspection eliminates **our** risk! Every **WILLIAMS** Tool and forging is guaranteed.

The just out, 1912 Catalogue (pocket size) will interest every user of tools and drop forgings; mailed free.

J. H. WILLIAMS & CO., Superior Drop-Forgings
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Stanley Tools



"Zig Zag" Rules

In the longer lengths they might well be called "Folding Tapes."

They have, however, this advantage,—

As the joints are held open by springs, they can be used to measure across openings by supporting the end away from the user, where with a tape it would be necessary to have one person hold each end, or else hang the outboard end on a nail, necessitating additional climbing.

In many cases they are useful for measuring concave, convex, and various uneven surfaces.

When the entire length of the Rule is not required in measuring, those joints not open form a very convenient handle. When folded, they are compact and easily go in the pocket.

Stanley "Zig Zag" Rules are exceptionally well made,—are of thoroughly seasoned wood, and have a specially fine finish.

The joints contain a stiff spring which holds the Rule rigid when open, even in the longest lengths.

Made in 2, 3, 4, 5, 6 and 8 foot lengths, in several styles of figuring, and with white or yellow enamel finish.

Folding Rules are carried in stock by all hardware dealers. Be sure when purchasing that the trade-mark "Zig Zag" is stamped on the Rule at full length, or in its abbreviated form "Z Z."

Catalogue No. 34-A contains complete description of all styles. May we send you one?

Stanley Rule & Level Co.
NEW BRITAIN, CONN. U.S.A.

The Delight of Sharp Tools

A good workman keeps his tools sharp. Good tools and a good grindstone to sharpen them on, enables one to work for himself or the other fellow at a paying clip.

CLEVELAND GRINDSTONES



will sharpen anything that needs to be sharp. Most of the good tools and machinery you own were certainly sharpened and shaped on grindstones that came from our famous Borea and Huron quarries. No other equals them for uniform grit and necessary grinding hardness.

All Cleveland Grindstones bear our new trademark. They are your assurance that you are getting the genuine. The difference in grindstones is so great it will pay you to make sure you are getting the best as they cost no more than many inferior grades.



The Sterling Model is the same dependable Cleveland grindstone, mounted on a riding frame.

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EXTINGUISHES FIRE WITH THUMB—Hoseman Guy Hall, of the Manchester, N. H., flying squadron, found his six feet and over a good asset one morning last week, when the squadron was called to a dwelling fire in Prospect Street, to extinguish a blaze from an open gas pipe.

Men from the gas company had been at the house, installing a meter, and on leaving turned the gas on. A chandelier had been taken off previously in the parlor of the house, and the pipe left open. The housewife,

FOR MENDING HARNESS

shoes, tents, awnings, pulley belts, carpets, saddles, suit cases, buggy tops, dash boards, or any heavy material. Stewart's Automatic Awl is the only perfect Sewing Awl.

It takes a war thread, 16 cuts, from top to bottom, does the work of any horse-shoe maker's machine. It is indispensable for farmers. Agents wanted. Sent prepaid for \$1.25. Send at once for catalog.

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MADE IN 3 SIZES

No. 1 cap to 3/32 wire	...	\$1.00 each
No. 2 " " 3/16 "	...	1.50 "
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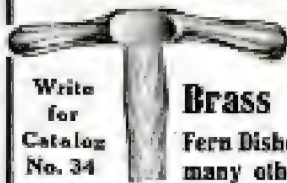
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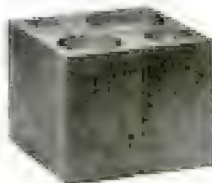
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smelling gas, went into the room and lighted a match. The gas instantly ignited, and when the firemen arrived there was a sheet of flame the size of a bushel basket playing about the pipe. Roseman Hall, who chanced to have on a pair of heavy leather gloves, calmly reached up and, placing his thumb over the pipe, extinguished the blaze for want of fuel.

There was fortunately no explosion, as the leak was



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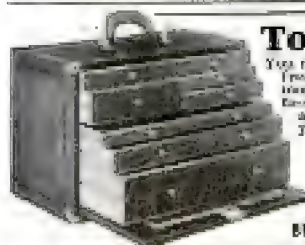
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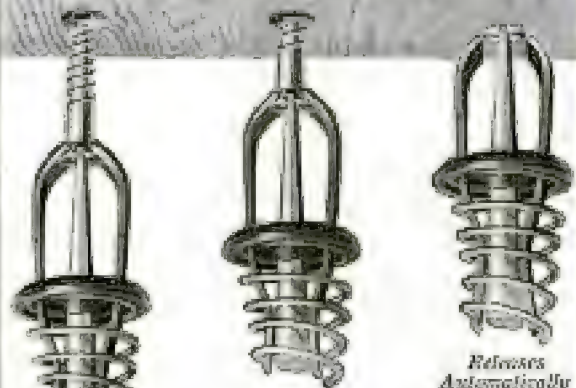
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HOLDS and places the Screw, drives it in by ratchet movement and automatically releases it.

Simple and practical: Just a pair of steel jaws, fastened to a spring, and fitted to the blade of a "YANKEE" Ratchet Screwdriver. Of course, the screwdriver must be exactly right — and it is *exactly right*; as made, adjusted to the blade and tested in the "YANKEE" Tools factory. The attachment is not sold separately.

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You work to big advantage

with this tool where you have to hold on with one hand; or in placing screws in cramped corners, high overhead, down holes, etc., etc.

"Yankee" Ratchet Screw-driver fitted with "Yankee" Screwdriver Attachment

No. 110. As illustrated. Right and Left Ratchet; and Right Ratchet-shifter working lengthwise with the tool.

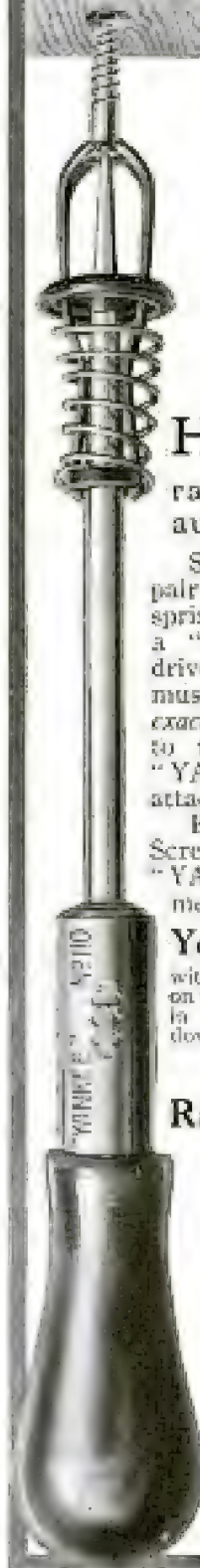
No. 111. Same, except shifter moves across tool.

FIVE SIZES: 3 in. Blade, 65c
4 in. Blade, 70c 6 in. Blade, 85c
8 in. Blade, 75c 7 in. Blade, 95c

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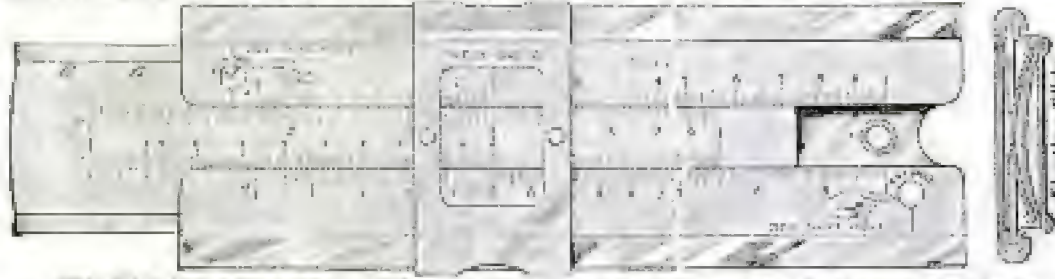
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discovered before the gas had become dense enough to settle to the floor, and the blaze was confined to that section of the room near the pipe. The firemen arrived in time to remedy the trouble by shutting off the gas in the cellar before any damage beyond a smoked ceiling was done.—Fireman's Herald.

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you will be able to do most any kind of work around the house. The bench is 4 1/2 ft. long, 22 inches wide and 32 inches high, made of hard maple, has 2 Patent Wood Screw Vises. The cabinet has three drawers, each 16 inches long, 18 inches wide and 2 inches deep, fitted with locks. The cupboard is 18 1/2 inches long, 18 1/4 inches high, and 10 inches wide, with lock on door, and will be shipped for \$14 you at once on receipt of

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The tool illustrated above will be indispensable to the Pattern Maker, Cabinet Maker, or Picture Framer who purchases it. It will set brads in places that would be inaccessible without it, and dispenses with the bradawl and nail set. If, after a fair trial, you are not satisfied that you have received your quarter's worth, your money will be promptly returned to you on receipt of tool. **Standard Tool Supply Co., 42 W. 15th St., New York City**

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About one-third of the books are replaced each year. The changes are made upon recommendation of those in charge of the ships, but it has developed that this

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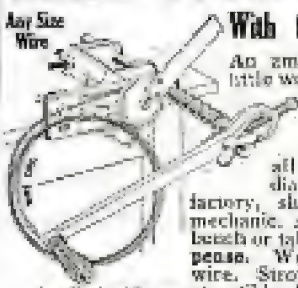


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An amazing and wonderfully efficient little worker that quickly turns out perfect compression or tension springs any size, from 3/8 inch to 12 feet long. Uses wire from No. 26 to 3/8 inch thick. Makes all varieties from 1/4 to 3/4 inches in diameter. Indispensable to every factory, shop, garage, repair shop and mechanic. Attaches with thumb screw to any bench or table. Saves time, worry and expense. Works accurately without waste of wire. Strong and durable—practically indestructible. Only machine of its kind. Write for descriptive circular, etc.

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AGENTS

Make \$30 to \$100 a week selling this marvelous invention. Everybody owning any kind of a machine with a spring on it, buys at sight. No competition. GET PARTICULARS. DON'T HESITATE.

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BUY the saw fit for master workmen. The price is so little more—the satisfaction so much greater. A

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doesn't need to be forced—just guide it. The teeth are accurately shaped, uniform and true. They hold their set and sharp, fast-cutting points, because we temper the steel by a process (exclusively our own) which makes it hard and tough—gives it the wearing quality saw-teeth need. We make our own special crucible steel, a wonderful metal for cutting-tools. You can't get this steel—SIMONDS STEEL—in other saws.

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is not a satisfactory method, as much depends upon the points of view on literature possessed by the responsible persons. So it is proposed to standardize the libraries by making the changes in Washington, applying them generally to all ships. It is further held that this plan would work for economy, effecting a saving of from \$10,000 to \$15,000 a year.—New York Sun.



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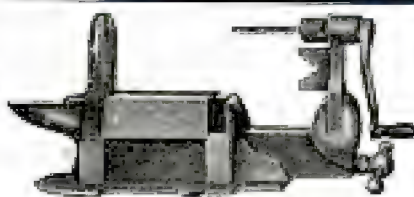
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5 Tools in 1

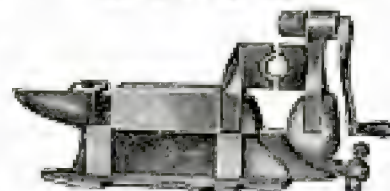
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Bureau of Mushroom Industry, Dept. 10, 1342 N. Clark St., Chicago, Ill.

AN ENGLISH CHANNEL FERRY—The project for connecting England and France by a ferry steamer is again to the fore, and it would appear that the prospects are brighter than before. The proposition is to run the ferry between Newhaven and Dieppe, and the London and Brighton Railway Company has been in conference with the Chemin de Fer de l'Ouest on the subject. The conference was of a private nature, but Mr. Forbes is reported to have said, "The project looks interesting. The first thing to be done is to obtain concessions from

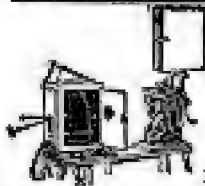
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Queen Quality's the one best bet for every smoker who wants his the hand-made way. It's granulated—cut specially for rolling cigarettes and it is sweet, tasty and fragrant.

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Stop off at the next tobacco shop and get acquainted with the Queen. She'll be your "steady" after that.

Save the labels of The Blue Bag!

For the fronts of 25 Queen Quality Bags we'll give you FREE a handsome Silk Art Kerchief of varied colors and designs, beautiful for making bed spreads, pillow covers, kimonos, etc. (Offer expires June 30, 1913)

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The American Tobacco
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**FREE—A full-sized bag of
Queen Quality—FREE**

Let us give you a full-sized sample bag of Queen Quality Tobacco. Fill in the coupon at corner of this page and mail it to us TODAY!

MAIL TODAY!

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Please send free of all charge to me, a full-sized sample Blue Bag of Queen Quality Tobacco. (Offer expires Dec. 31, 1913)

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This \$3 Silver Set Free

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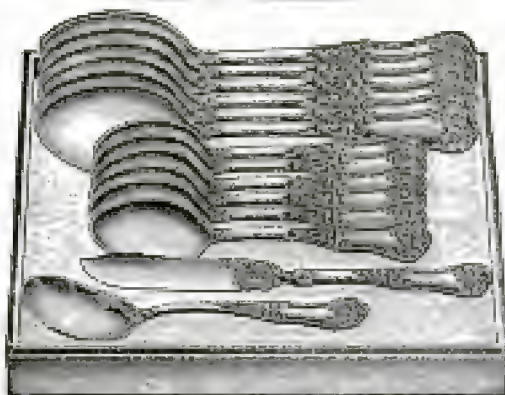
6 Teaspoons Butter Knife
6 Tablespoons Sugar Shell

This handsome 12-piece Silver Set is made by the Wm. Rogers Mfg. Co., of the highest grade, good heavy nickel silver metal, finely finished, and fully warranted not to wear off. The beautiful flower design is nicely embossed on all pieces.

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6 Teaspoons Butter Knife Sugar Shell

This half set contains 3 pieces of the same fine design and high quality as the full set described above. Comes in fancy silverware box.



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Made to Your Measure, Only **\$12.00**



Your tailor would ask \$25.00 to \$30.00 for a similar suit. Why should you pay him such an enormous price for no better garments?

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Remember, we guarantee to fit you—we tailor to your exact measurement, cut and trimmed exactly as you want it. There is positively no chance for a mistake with our simple, yet perfect, system of home measurement.

\$7.50 English Slip-on Raincoat **\$2.95** Absolutely Waterproof

To prove how close we sell direct to you, we will send you a handsome, durable \$7.50 English Slip-on Raincoat, absolutely waterproof, for \$2.95, with every order for a suit or overcoat.

The Fort Dearborn National Bank of Chicago will tell you that we are responsible. Be sure and send for our free Style Book today. Local Agents wanted in your territory.

Madison Tailors 275 Central Union Block, CHICAGO, ILLINOIS

great measure the same argument applies in the present case, and unless there is very hearty co-operation on the French side the scheme must again fall through. It is regarded as significant that recently the French Minister of Public Works presided at a dinner given in honor of the London and Brighton Railway at which Lord Bessborough represented the railway.—London Engineering.

A motorcycle driven by a petroleum engine was patented as far back as 1885.



YOUNG MAN

Would You Accept

and wear a fine tailor-made suit just for showing it to your friends? Or a slip-on raincoat free? Could you use \$5 a day for a little spare time? (Perhaps we can give you a steady job at good pay). Then write us at once and get beautiful samples, styles, and an offer so good that you can hardly believe it.

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Please Mention Popular Mechanics

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Ask your clothing man first, if he hasn't Signal Coat Shirts, tell us his name, your size and we'll express you a couple. If you like them pay expressman \$1.00 per garment (\$1.25 west of Missouri River). Write for folder showing styles.

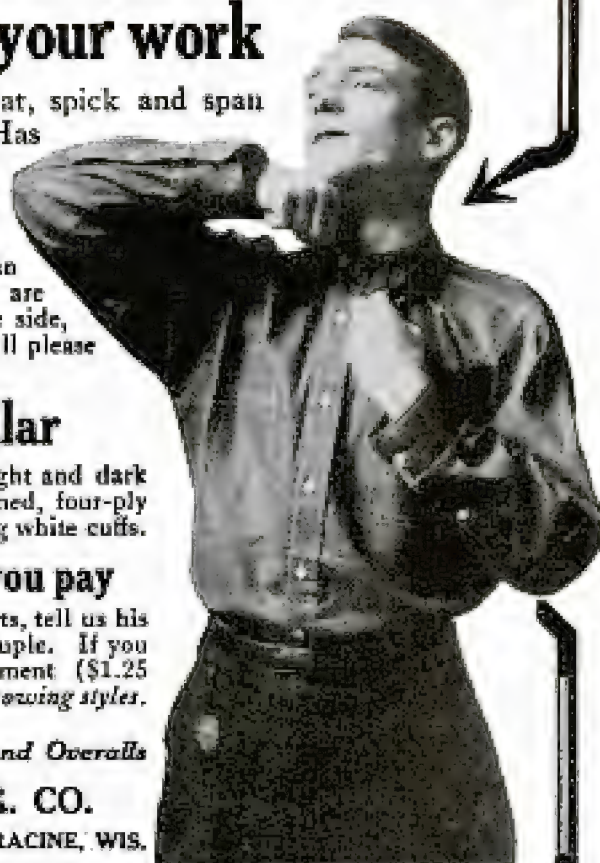


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TRAIN EAGLES TO FIGHT MILITARY AIRCRAFT—"The eagles of war" will cease to be a figure of speech if the plan of a French expert on aeronautics is put into practice and a corps of real eagles organized to fight aircraft. According to the French journal L'Armée Moderne, it has been found considerably more economical to train eagles to fight the enemy's aircraft than to attack the machines in other ways. The eagles are first accustomed to the noise of propellers and cannon and rifle fire and then trained to attack aeroplanes and dirigibles by attacking tempting bait to dummy



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for only \$1. Genuine Leonard Watch, 14 size, stem wind, stem set, highly polished movement. Handsome dial, sunken second dial. Case Composition Gilt Metal; looks like gold. Case NOT gold plated, but solid of same metal throughout. Splendid timekeeper, works and case guaranteed for 1 year. New Watch, just on market; smaller and better than any \$1.00 Watch ever offered before. By Mail, Postpaid, Only \$1.00.

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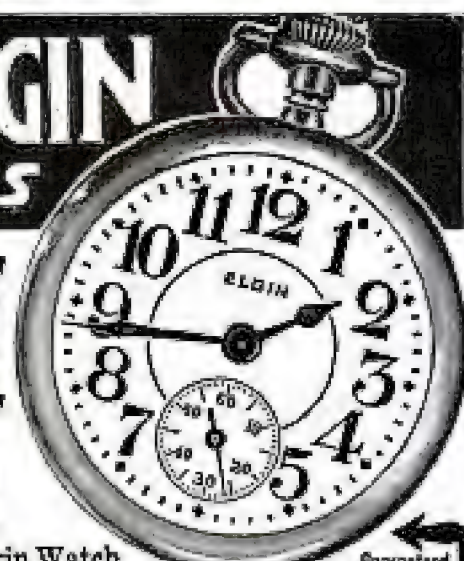
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OUR NEW FREE WATCH AND DIAMOND BOOK, also our book called "Facts vs. Fune" or all about the watch business, both at home and abroad. **HARRIS-GOAR CO. Dept. 576, KANSAS CITY, MO.**

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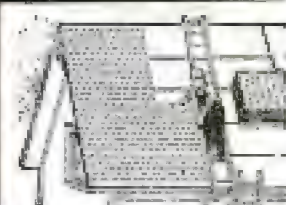
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Small Power for Small Shops

Every owner of a home work shop, wood shop, machine shop, blacksmith shop, tin shop, candy shop, print shop, or in fact any kind of shop should investigate

I H C Small Gasoline Engines

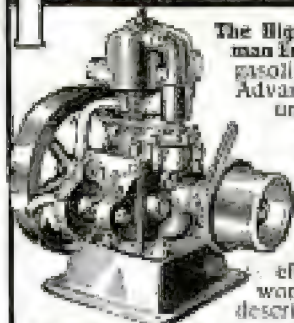
They give reliable power at a surprisingly small cost. Simple, easy to start, and will last as long as the machines they operate. I H C engines require no attention while running except a little lubricating oil every hour or two. Built in sizes and styles for every shop, 1, 2, 2½, 3, 4, 6, and up to 50-horse power—air cooled, tank cooled or hopper cooled, either horizontal or vertical.

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Easy speed changes, special friction clutch pulley. Also new 6-8 and 20 h. p. high efficiency engines for heavy work. Now ready. Free book describes all. Write for it.

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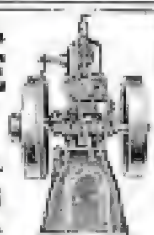
Thousands of tons of this rocky material accumulate each month, and for years great piles of what the workmen call "chats" were to be found scattered all over that section.

Roads were constructed from this refuse. Then all

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Very simple and easy to engineer, yet has the latest improvements of the day. Prices attractive. Shipped on trial.

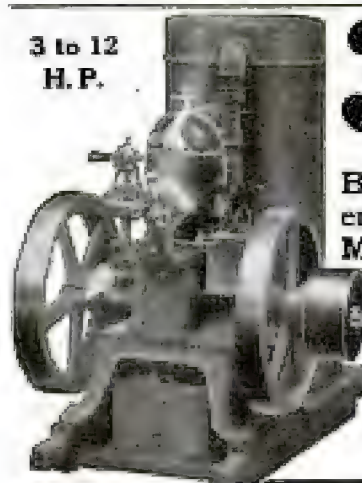
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3 to 12
H. P.

34c

Runs this 6 H. P. Engine for a 10 hour day on KEROSENE

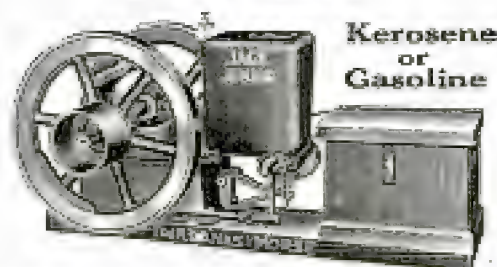


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It will do the washing, cream separating, churning, pump water—or better still, operate a water system—and do it on a pint of kerosene or gasoline an hour. You will find it a money, time and labor saver for your work, too. Use it to grind feed, grind tools, shell corn, chop hay or fodder, spray.

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Wages and Portable Stacks, Oil and Gasoline Engines, Oil Tractors, Pumps, Water Systems, Electric Light Plants, Windmills, Feed Grinders.

the railroads entering that section used it for ballast.

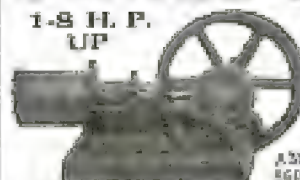
When cement paving was begun gravel was scarce, while this refuse was to be had in great quantities, and it was found to be as good as any other material for the body of concrete paving.

Next the refuse found its way into cement foundations, and then into building blocks used as steps, window caps and sills—and, in fact, anything in the form of cement construction.

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1-8 H. P.
UP



Steam, Gas and Gasoline. For Amateurs and Mechanics. Circulars for Stamps. Big Catalogue Engines, Small Power Machinery and Electric Light Plants. 1 Light up. Sent for 10c (coin preferred). Rushed free order.

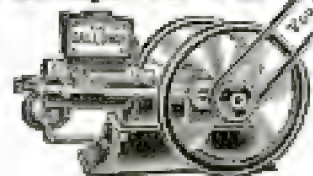
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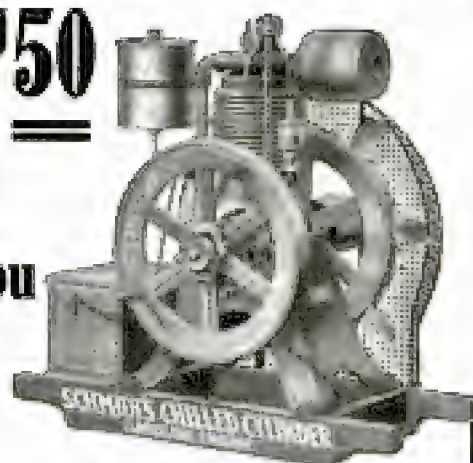


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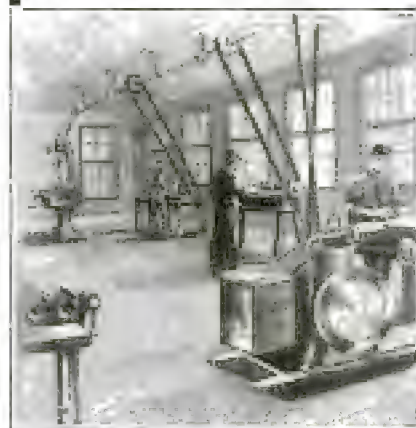


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We will ship you a Schmidt's Chilled Cylinder Gasoline Engine for you to use as if it were your own for 10 full days. Then, if you don't want it send it back at our expense. If you wish to keep it, pay as low as \$7.50 and you can pay rest in easiest monthly payments. Send coupon or a postal card for all particulars.

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Department 1197

Davenport Iowa

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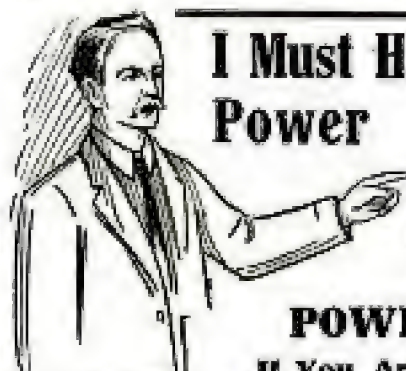
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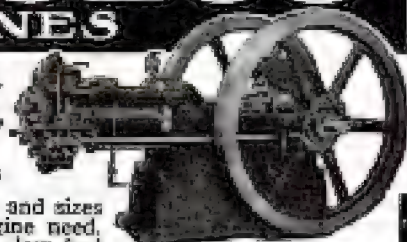
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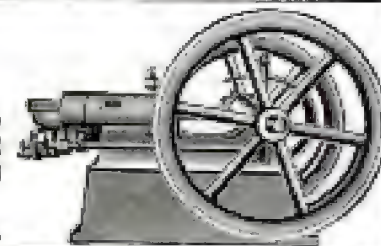
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It is cheap, costing but a trifle per load, and about all the outlay of contractors in securing it is the cost of getting it to the place it is to be used. It has brought down the prices of cement work, and mechanics declare it is first-class in every respect.—St. Louis Post Dispatch.

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Takes This
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Saves 50% in Fuel

Built on The ONLY Correct Principle World's Best Farm Engine

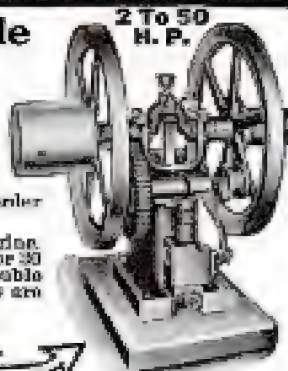
Remember, the "UNITED STATES" is the only Engine which stands on its feet—not a Horizontal or Standard Vertical. Explosions occur low down and shock is transmitted directly into the earth—not into the engine! Result

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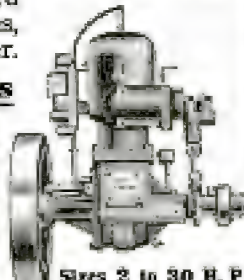
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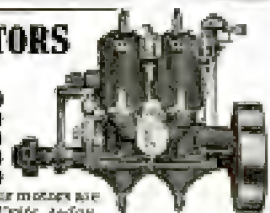
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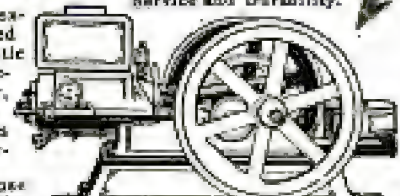
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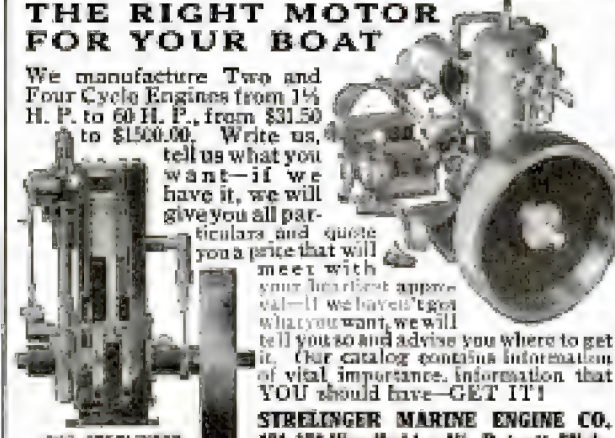
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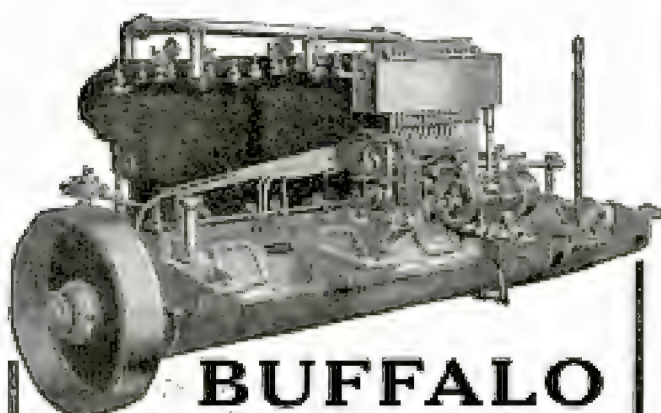


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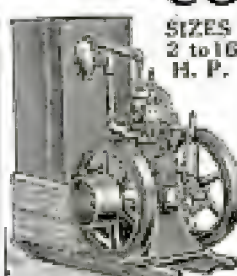
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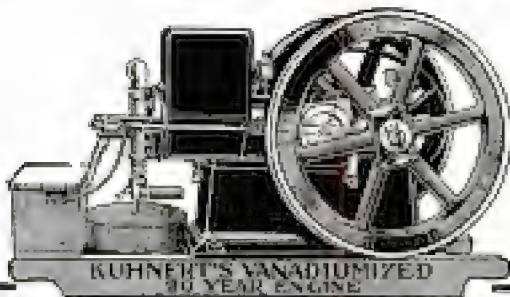
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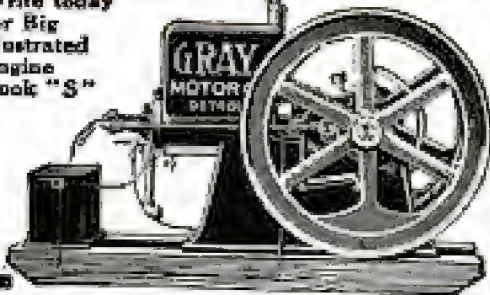
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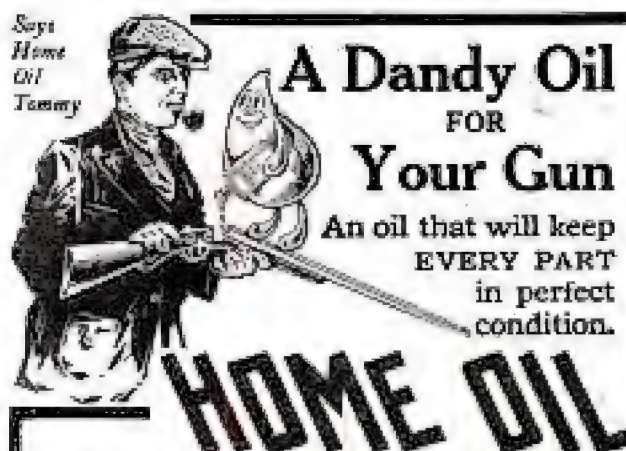
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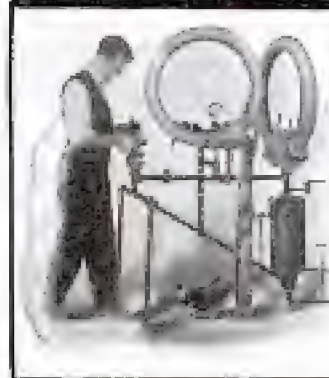


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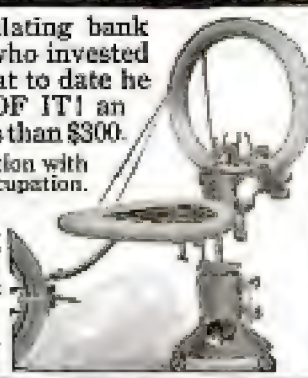


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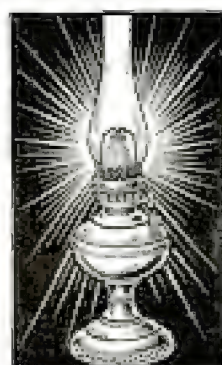
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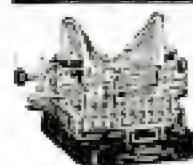
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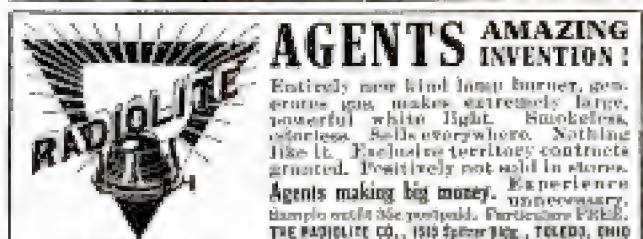
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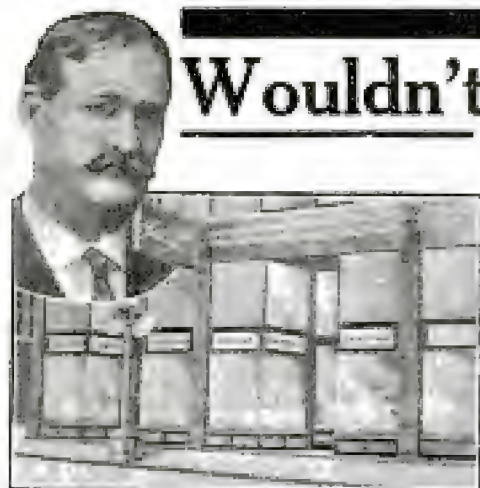
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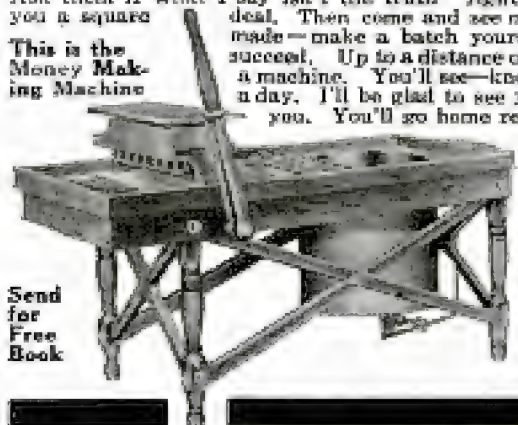


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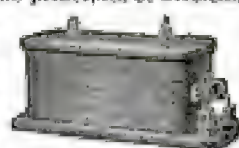
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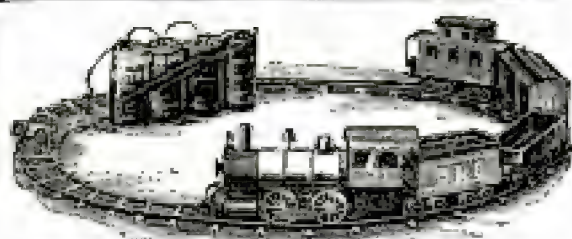
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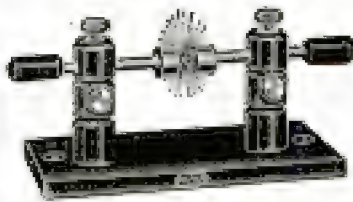
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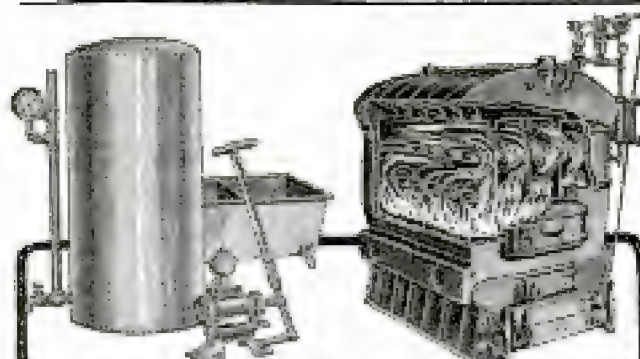
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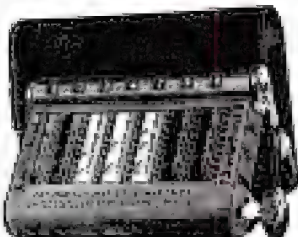
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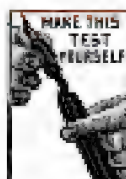
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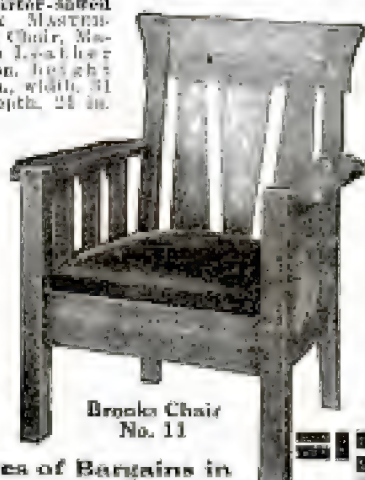


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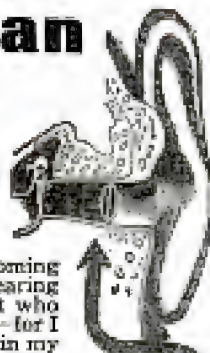
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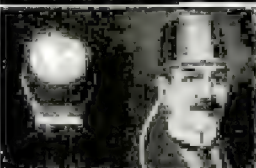
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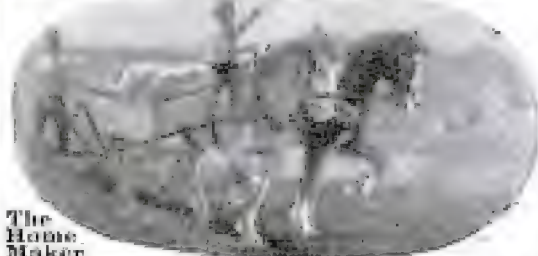
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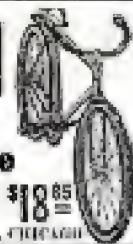
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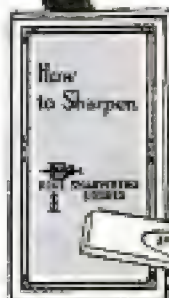
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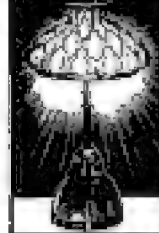
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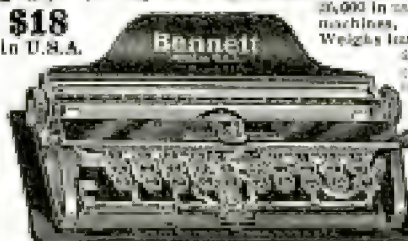


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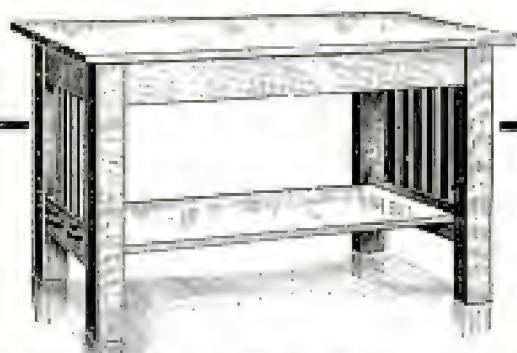
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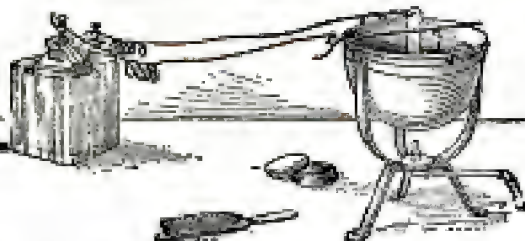
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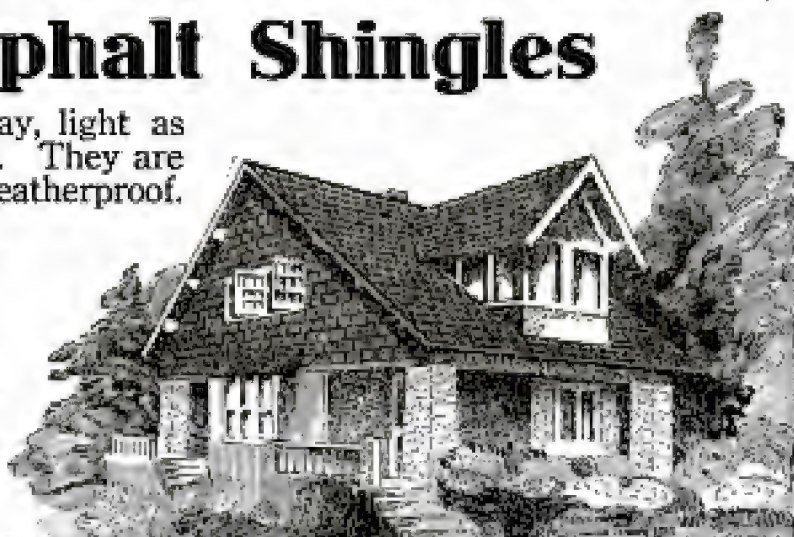
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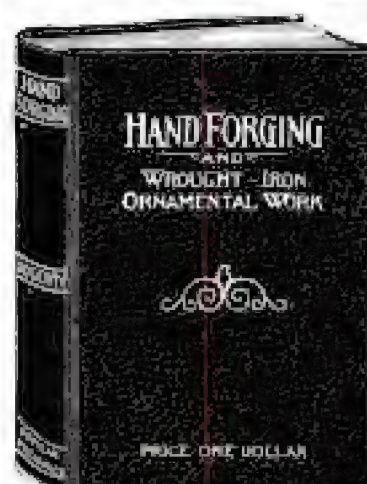
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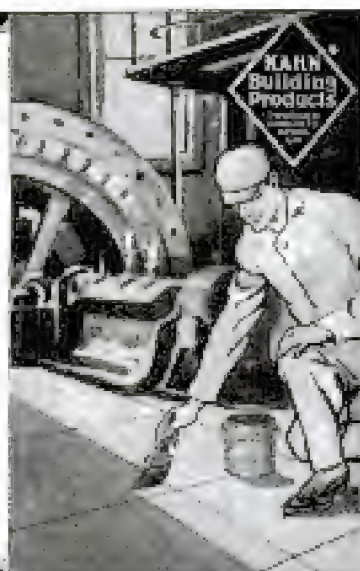
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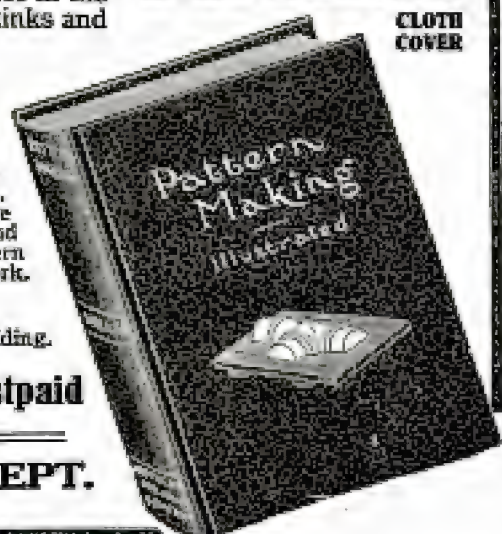
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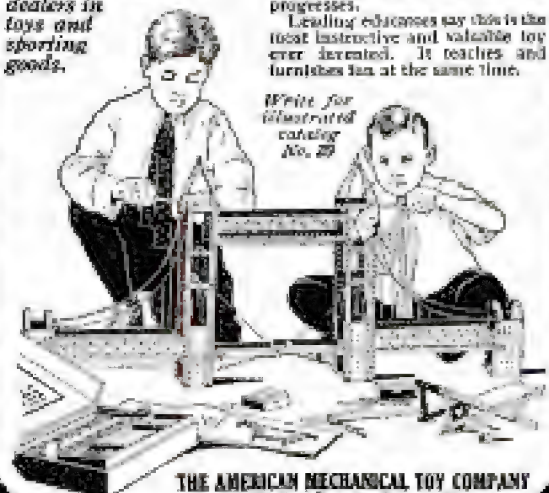
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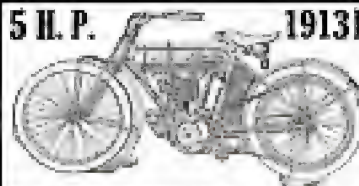
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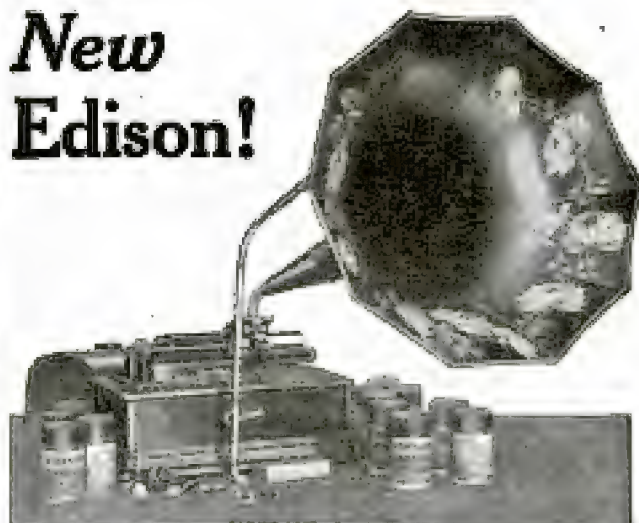
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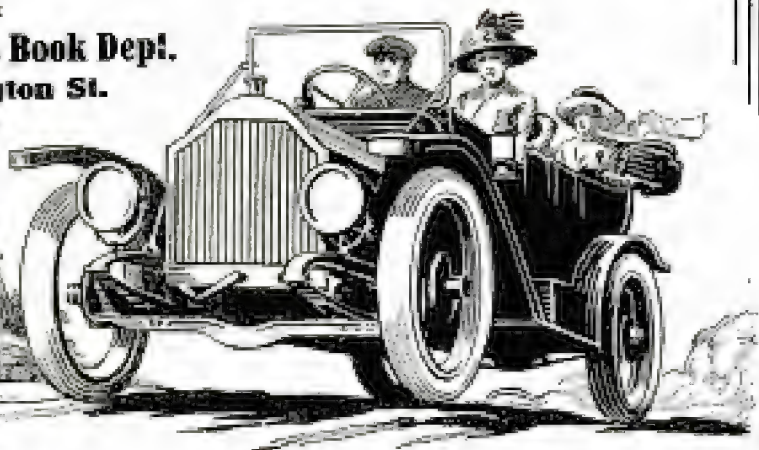
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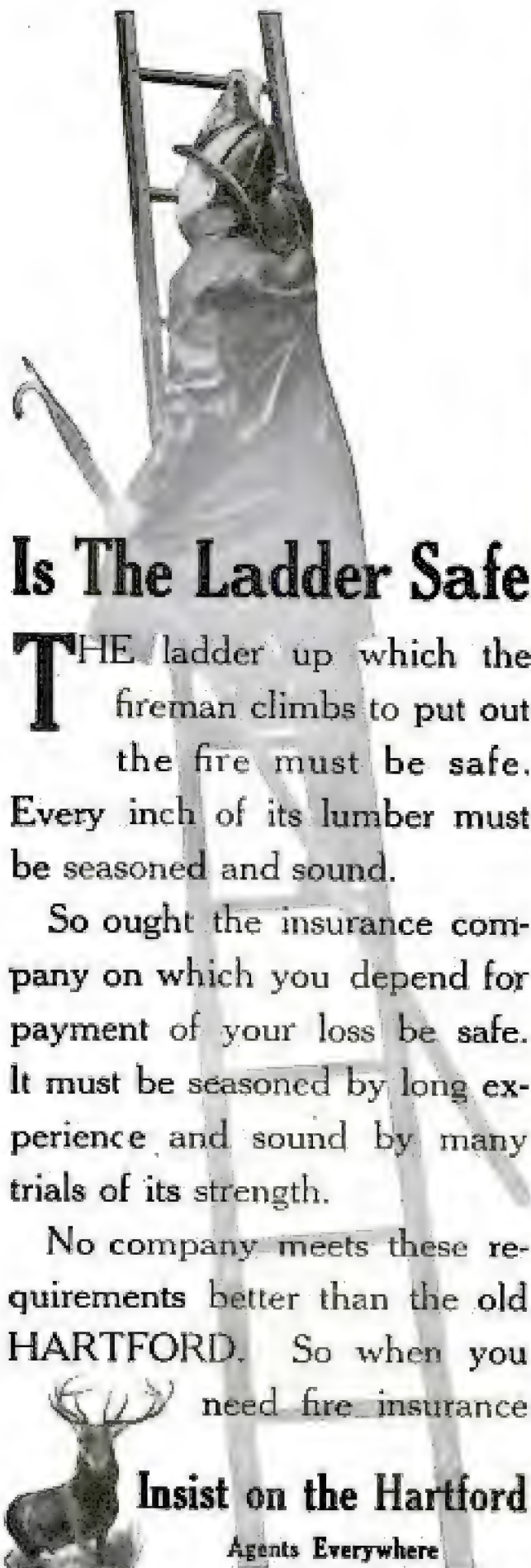
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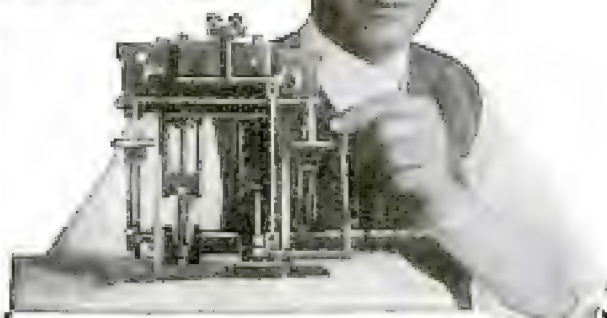
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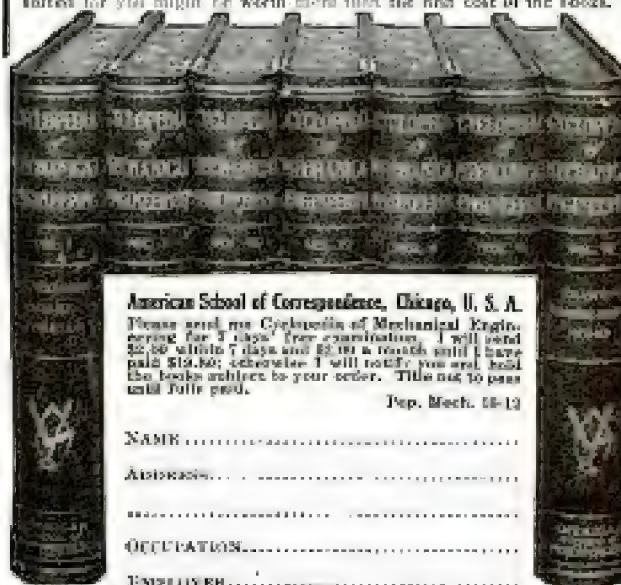
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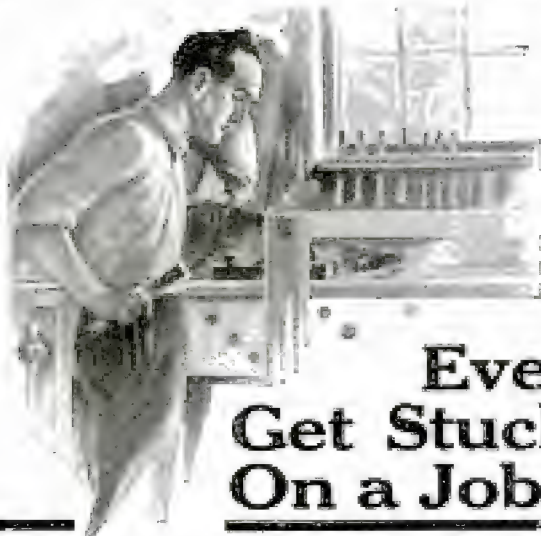
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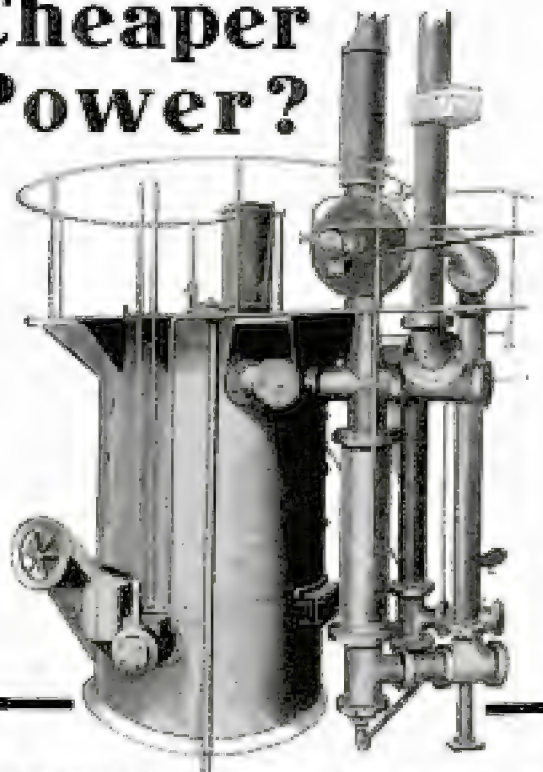
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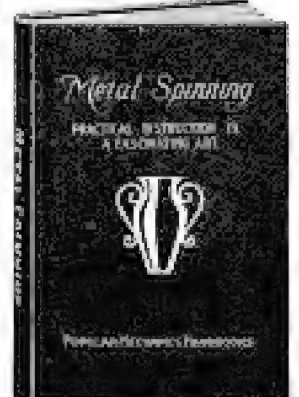
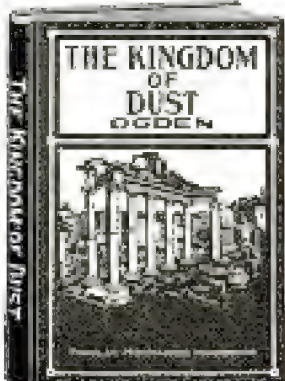
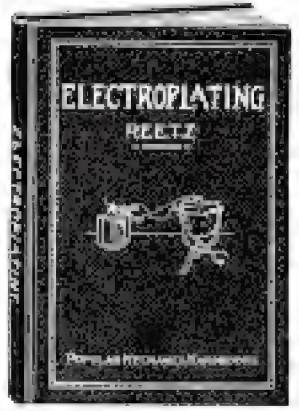
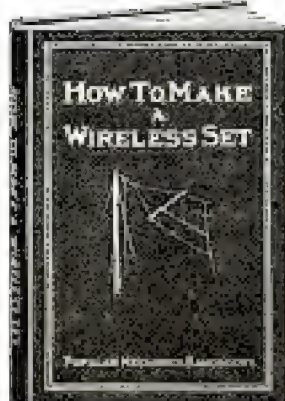
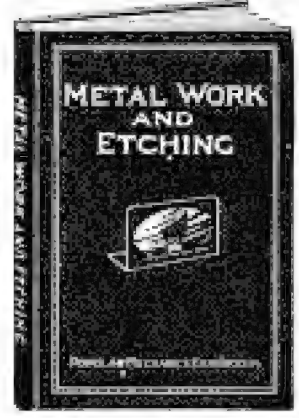
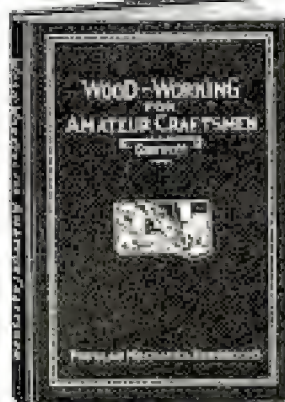
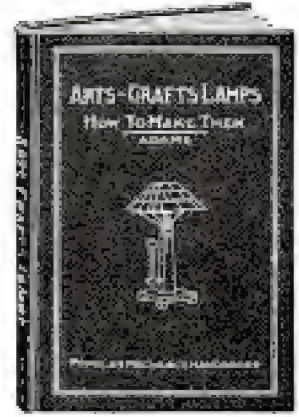
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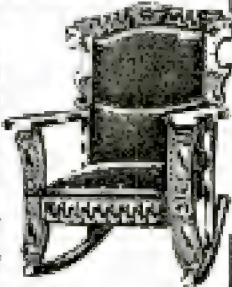
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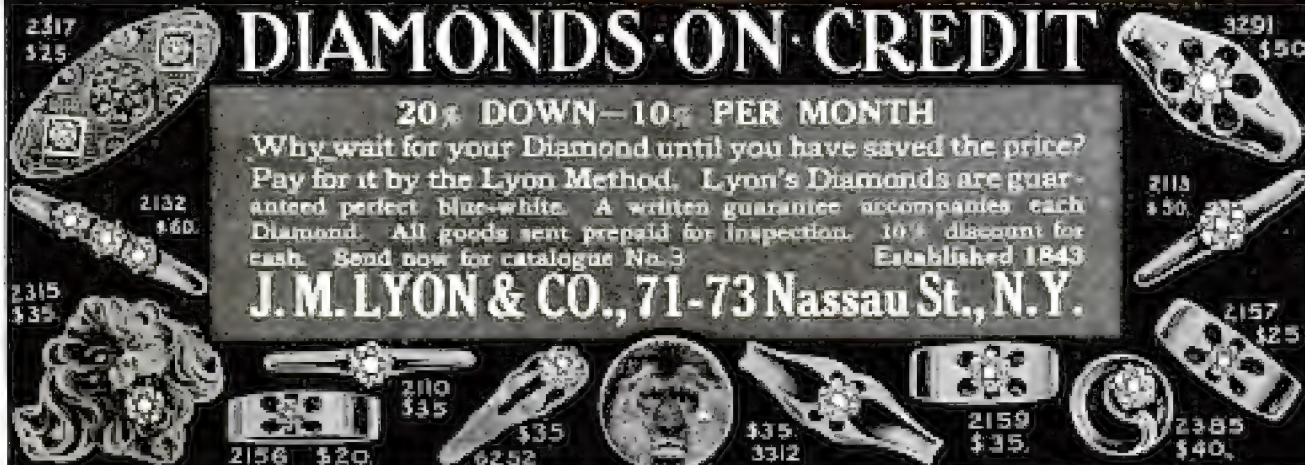
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